# Science and Technology Literacy for All

## Chandigarh Scripts

## 2002

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# Authors

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## Scripts

1. Alcohol: End of Life
2. Is All Water Safe for Drinking?
3. If Rycle Can Cycle and Save Money, Why Not Others?
4. Corrosion of Metals
5. How Can We Make Stronger Buildings?
6. What Will Happen if a Nuclear Bomb Falls on Lahore?
7. Can I Do Yoga to Relieve Menstrual Cramps?
8. Does Zarda Effect Your Work Performance?
9. What Kind of Cloth Stretches a Lot?
10. Mouldy Rajma
11. Is it Necessary to Behave Badly When There is a Lot to Do?
12. Sounds: Their Effects
13. Can Deep Breathing Help Me Relieve Physical Fatigue?
14. Can We Get Rid of Malaria?
15. How Clean is the Air We Breathe?
16. Degrading Waste

# Science and Technology Literacy for All

The Scripts in this book were written as the culmination of a project for Science and Technology Literacy for All, which was carried out by the Centre for Education and Voluntary Action (CEVA), Chandigarh, which was chosen as a nodal agency in a joint UNESCO/ Delhi University project.

Under this project, we conducted a series of workshops in which teachers were oriented to the meaning and purpose of Science and Technology Literacy (STL), and designed, tested, and produced teaching ideas and materials that they used to spread STL in their own schools.

Out of the 30 participants and 5 organisers of our three STL Workshops, about 20 people took an active part in developing, writing and trying out part or all of at least one STL Script. Of those who took an active part, most were either teachers in private or government schools or mothers working with their own or small groups of children.

Most teachers made use of the STL Scripts as part of their normal syllabus. In some cases it was clear that they purposely chose STL problems that were related to topics in their syllabus. Otherwise they may have had difficulty finding the time to try out the Scripts in their classrooms. Some of the teachers who failed to try out Scripts failed because they were not teaching topics related to the Scripts. Even if school principals tell the teachers that they are free to deviate from the syllabus, many of them have a reluctance to do so, perhaps due to fear, lack of motivation, or insufficient time to plan and/or carry out their plans.

## Objectives

The aim of this project was not only to encourage teachers and parents to use innovative science teaching approaches with their own children, but also to train resource people who could continue to work as 'teacher trainers'. We also wanted to provide support for schools and individuals who would like to try alternative methods of teaching/learning. Above all, we wanted people to learn that science is a way of thinking, observing, questioning, experimenting and analysing, and to encourage them to develop a scientific temper and use science in their everyday lives.

## Results

Following are some ways the participants benefited from the STL project - as they reported in post-workshop questionnaires:

- They got to share experiences with each other.
- They liked doing experiments and activities in the Workshops and in their own classes.
- They liked trying out something new.
- They appreciated having a chance to interact with 'professionals other than school teachers.'
- They became motivated to improve their teaching.
- They seemed to gain a fairly good understanding of what STL is all about.
- They became more interested in listening to the questions raised by children.
- The importance of learning by doing rather than lecturing was emphasized.
- Participants liked the prospect of having their Scpts published and seeing their names in print.

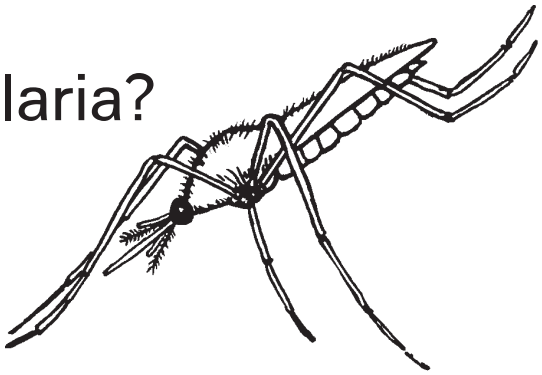
## Our assessment of the STL Project

- Our node participated only in Phase II. For CEVA, this was our first venture into science literacy. In the process we ourselves learned a lot about giving Workshops, doing science, and training teachers and others.
- Trying out a few parts of STL Scripts in the Workshops was a big success. For example, in our 1st Workshop we divided the teachers into small groups and asked them to devise ways to test the stretchiness of cloth. Through this activity the teachers came to see firsthand how children could conduct activities in class, how an activity could be open-ended, how group work can be organised, how inexpensive materials for activities can be improvised and supplied, etc.
- We could have made more effort to go to schools to help teachers try out their STL Scripts in their classes. This would, however, require at least one full time, paid worker (or several part time workers) from CEVA. The funds were not adequate for this.
- One of our aims was to build a Resource Centre where teachers and others can come to find books, ideas for activities and teaching methods, ideas for teaching aids and equipment, advice, feedback, etc. We need to put more effort into developing this Resource Centre and making it a popular meeting place for teachers, parents, tutors, etc. This also requires more funding for staff who can be present in the Resource Centre to handle visitor's queries, organise materials, etc.
- Some teachers seemed to be happy to attend the Workshops, but were not motivated to work too much between the Workshops – a few did not seem to make much effort to try out STL ideas in their classes.
- Some of the teachers we called to the Workshops did not seem to have sufficient interest in the project – perhaps they came primarily because their Principal had asked them to come, or maybe just to have a day off from teaching. We need to put more effort into finding teachers who can become so interested in the project that they will gladly take initiative and find the extra time that is required.
- Although we did include some hands-on teacher training in our Workshops, perhaps we could have included more sessions in which the participants taught children and analysed their own teaching methods. Given the lack of experience of many of the teachers in innovative, activity-based teaching methods, this would have been useful.
- We may have benefited if we had been able to call one or two people from outside Chandigarh who were experienced in science teacher training to help in the Workshops.
- In our Workshops we would have liked to be able to show an exemplar film of teachers trying out the STL approach in an actual classroom. This would have given teachers a better idea of alternative teaching approaches that can be used in their own classrooms. However, we did not have any such films, nor did we have the projection facillities.
- We would have liked to use a video camera in the Workshops to help train teachers and parents in teaching methods. At the time we did not have access to or funding for a camera, however.

# Can We Get Rid of Malaria?

**Subash Chander & Madhuri Devi**
**Aasha School, Sector 25, Chandigarh**

Age : 3 – 10 years



## Introduction

It has been claimed that throughout history more people have suffered from malaria than from any other disease. People have been fighting both mosquitoes and malaria long before the connection between the two was established. For thousands of years people have tried to protect themselves from mosquitoes by sleeping under mosquito nets or in elevated structures, and by keeping land ploughed and properly cared for. A number of effective prophylactics and treatments for fever of various kinds including malaria were discovered in ancient times in China, South America, India, and other places. Since the end of the nineteenth century we have known that malaria is due to a tiny protozoan that is transmitted to people by mosquitoes. Health workers can confirm whether a person suffers from malaria by examining a drop of their blood under a microscope (using a magnification of at least 600 times) to see if it contains this parasite. We now know that we can reduce malaria by reducing mosquitoes. Mosquitoes can be reduced by eliminating the open, standing water they need for breeding. But why do we still not take more care to reduce malaria? As science teachers, can we do something to get rid of malaria?

## Science Concepts

1. Malaria is caused by a microscopic parasite
2. Malaria is spread by mosquitoes that carry the parasite
3. Identification of a mosquito larva, pupa, and adult (especially anopheles)
4. Symptoms of malaria include fever and chills
5. Malaria can be controlled by reducing mosquitoes and their breeding places in water

## Prior Knowledge

1. Experience of fever and chills in self or others
2. The children already know what adult mosquitoes look like

## Teaching Material

1. Spade
2. Shovel
3. Buckets and other cleaning materials

# Students' Guide

## Scenario

Suman lives with her grandmother in a basti in Chandigarh. Her grandmother does most of the work in the house and Suman helps her out. Today for a change Suman is doing all the work in the house as her grandmother is down with fever and she is shivering. Suman is very worried and doesn't know what to do.

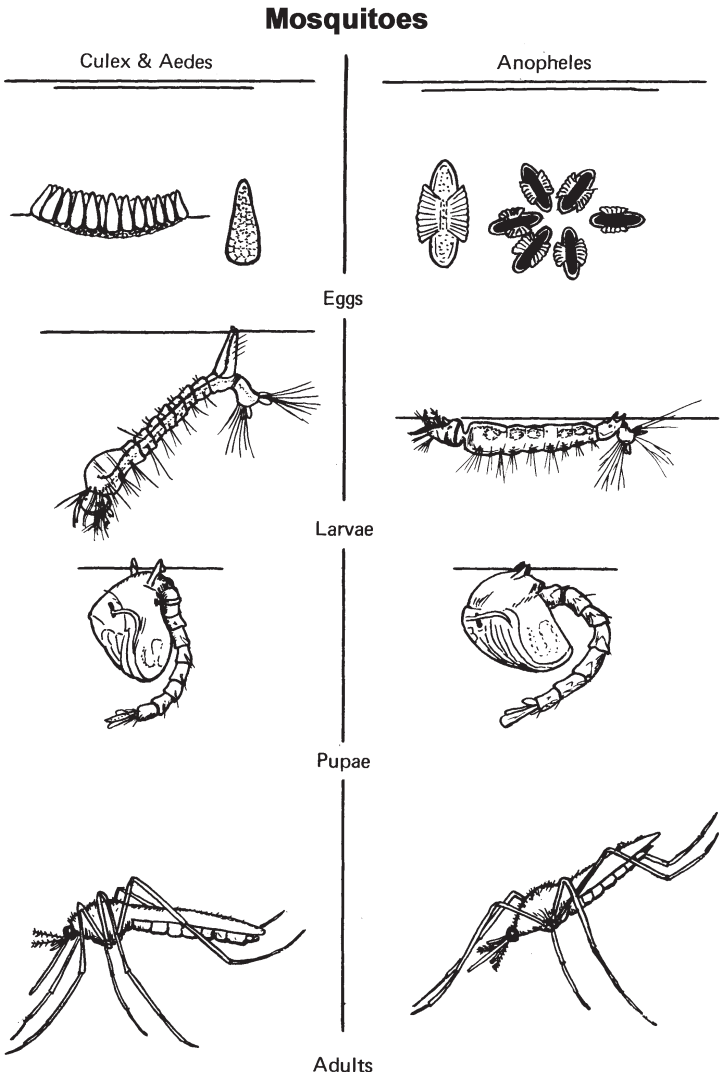
When Suman's friends go to call her they get to know her problem. They inform their teacher who also lives in the basti. The teacher tells them that Suman's grandmother is probably suffering from malaria and needs to see a doctor for a blood test and treatment.

The teacher then tells the children how malaria is spread through the bites of mosquitoes that breed in stagnant water. The children realize that their basti is full of puddles of stagnant water and they decide to do something to clear them.

## Your Tasks

1. Enact the scenario
2. Remember the symptoms of malaria: weakness and fever.
3. Understand that malaria is spread by mosquitoes that carry malaria germs.
4. Look at the life cycles of mosquitoes on the right. Find mosquito larvae in dirty pond water. Collect the larvae in a glass jar and observe them to see how they change into adult mosquitoes.
5. Identify Anopheles and other kinds of mosquitoes.

   Share the above knowledge with other people in the basti.
6. Discuss some possible measures to get rid of malaria.
7. Undertake a clean-up program in the basti.



## Student Handout

To organize an awareness programme it is important to first find out how much awareness people already have. Find out by conducting a survey.

For example, you mighty ask people the following questions:

1. Size of your family:

   Number of adults _____

   Number of children _____

2. Has anyone in the family suffered from malaria in the past one year? _____

   _____

3. What line of treatment was taken up? _____

   _____

4. Was a blood test done? _____

5. Do you know what causes malaria? _____

6. If yes, where does the mosquito come from? _____

   _____

7. Do all mosquito bites cause malaria? _____

8. Level of cleanliness around the house _____

   _____

9. Any stagnant water around the house? _____

10. Any stagnant water inside the house? _____

11. Does the family take any other precaution? _____

    _____

12. Other questions: _____

    _____

    _____

    _____

    _____

# Teachers' Guide

## Suggested Teaching Strategy

1. Enact the scenario with the children.
2. Hold a brainstorming session on all that children know and don't know about the causes, symptoms, spread, treatment, and control of malaria.
3. Get the children to analyse and question the things they have said about malaria. Everyone should discuss whether their beliefs make sense, are contradictory, incomplete, etc. The teacher can ask questions like the following in order to get the children to understand the basic information about malaria. Try to get the children to think of the answers for themselves. Give the answers [as shown in parentheses] only when the children cannot think of them. For young children, there is no need to go into more detail then this.
    a) What happens when a person has malaria? [The person has fever, chills, and weakness.]
    b) What causes malaria? [Malaria is caused by a germ – a very tiny living thing - that lives inside some kinds of mosquitoes.]
    c) How do people get the malaria germs? [When such a mosquito bites a person, the tiny malaria germ may go into the person's blood.]
    d) What happens when the malaria germ goes into a person's body? [The tiny malaria germ lives and grows inside people, and causes fever and chills.]
    e) How can you tell if you have malaria germs inside your body? [The germs are too small to see. Doctors can test a drop of blood in a microscope to see if it has the malaria germs.]
    f) How can malaria be cured? [Doctors can give pills to kill the malaria germs inside the body, and make the person well again.]
    g) How can we prevent malaria? [Malaria can be prevented by getting rid of mosquitoes.]
4. Look at the life cycle of a mosquito. If possible, collect larvae, pupae and adult mosquitoes to show to the children. Best would be to bring them to a place where mosquitoes are breeding in stagnant water and ask them to collect some larvae and/or pupae. Keep them in a closed jar and observe for a few days to see how they change and whether adult mosquitoes emerge. Or perhaps some adult mosquitoes could be caught and kept in jars half full of water to see if they lay eggs in the water.
5. Ask the students to tell how the Anopheles mosquito differs from other types of mosquitoes. They can tell by looking at the pictures. The Anopheles can most easily be recognised by the way the adult 'stands on its head.'
6. Ask the students to go around the basti to find and count puddles and ponds of stagnant water.
7. Help the children organize an awareness talk in the basti.
8. Organise a program for the control of malaria which will include cleanup, drying of puddles, and perhaps application of 'safe' insecticide by adults who take proper safety measures.

# Additional notes for the teacher

Malaria is a dangerous parasitic disease common in many parts of the world, especially in less developed areas. It is caused by a protozoan (a kind of germ, or microscopic organism) called Plasmodia. This parasite enters a person's blood when they are bitten by a mosquito that carries the parasite. The female Anopheles mosquito is the main carrier. Victims of malaria suffer attacks of fever and chills. Two to three million people die of malaria each year.

There are four types of malaria, each of which is caused by a different species of *Plasmodium*. The four protozoans that cause malaria are *P. falciparum*, *P. vivax*, *P.* ovale, and *P. malariae*. (The *P.* stands for *Plasmodium*.)

**Symptoms:** The first symptoms are similar to flu: general weakness, followed by fever. There may also be headache and muscular aching, nausea, vomiting, and abdominal pain. After a few days, fever and chills may become periodic, e.g. with fever rising at the same time every one or two (or three) days. Fevers may reach 41.1 °C. After each attack of fever, the patient perspires, causing the body temperature to drop to normal. Between attacks, the patient feels better but is weak and anaemic. However, the pattern of fever and chills regularly repeating is not always found. The best diagnosis can be made by microscopic examination of a drop of blood.

The most serious type of the disease is caused by P. falciparum, which is more rare than the other types in India. Its victims become weaker with each attack of fever, and many of them become unconscious, have convulsions, and die if they do not receive prompt treatment. In *P. vivax, P. ovale,* and *P. malariae* infections, the attacks get less severe and finally stop, even without treatment. But in *P. vivax* and *P. ovale* infections, the symptoms may reappear after a long period.

**Spread:** The life cycle of the *Plasmodium* protozoan includes three basic stages. The first stage occurs in the mosquito's body, and the second and third stages take place in a person's body. The first stage begins when the mosquito bites someone who has malaria. Plasmodia enter the insect's body and reproduce in its stomach. Young protozoa enter the mosquito's saliva.

The second stage occurs after the mosquito bites another person. Plasmodia from the mosquito's saliva enter the person's blood. They travel to the liver, where they multiply and form clumps of parasites. After several days, these clumps of parasites burst and release new Plasmodia. During the third stage, each Plasmodium invades a red blood cell, where it multiplies again. The infected blood cells eventually rupture and release large numbers of Plasmodia, which invade additional red blood cells. This invasion, multiplying, and cell rupture by the parasites continues, causing the periodic attacks of fever that are typical of malaria. An attack occurs each time the red blood cells rupture. Some *Plasmodia* develop in human blood and reproduce in a mosquito's body. They enter the insect's body when the mosquito bites a person, and their life cycle begins again.

**Treatment and prevention:** Doctors diagnose malaria by identifying Plasmodia in a sample of the patient's blood. Most cases can be cured by anti-malarial drugs. Some varieties of *P. falciparum* have become resistant to the most widely used of these drugs (chloroquine) and new drugs are being developed to solve this problem. Antimalarial drugs can prevent the disease in addition to curing it.

People who live in areas where there is a lot of malaria usually develop their own immunity after repeated infections. Therefore the symptoms of malaria are more common in children who have not yet developed immunity and in migrants from areas that do have malaria.

Malaria can be prevented by preventing exposure to mosquitoes. People can cover their bodies with clothing and bedding, use mosquito netting and insect repellents and put screens on windows and doors. Smoke, agarbatti, 'mosquito coils,' and chemical repellents such as 'Goodnight' repel mosquitoes, but may be undesirable for people to breathe.

Malaria can also be prevented by controlling or eliminating the Anopheles mosquito. Proper water and sewage systems, and prevention of standing water removes possible breeding grounds that mosquitoes require in order to reproduce. Therefore highly developed countries tend to have eliminated or greatly reduced malaria. Bodies of stagnant water where the insects breed can be drained or filled in. Water bodies and/or people's homes can be sprayed with insecticides to kill mosquitoes.

During the 1950's and 1960's, the World Health Organization (WHO) tried to wipe out malaria. At first, the widespread use of insecticides, particularly DDT, eliminated malaria in some areas and greatly reduced the number of cases in others. However, Anopheles mosquitoes became resistant to DDT and other insecticides, and some Plasmodia became resistant to drugs, so the number of cases increased again. Also, the cost of fighting malaria increased greatly. These problems prompted researchers to step up efforts to develop a vaccine that could help eliminate the disease. At present there are no vaccinations to protect against malaria, but some scientists, such as the Colombian Manuel Patarroyo are trying to develop a vaccine.

## About The Script

The script was tried at an informal school in a slum area. The children were of the age group 3-6 years. Since the age group was very low the information was kept at a low level and the activities were very simple. The children depended a lot on the adults. They cleaned up the area, filled up puddles of water, and dug nullahs to drain stagnant water.

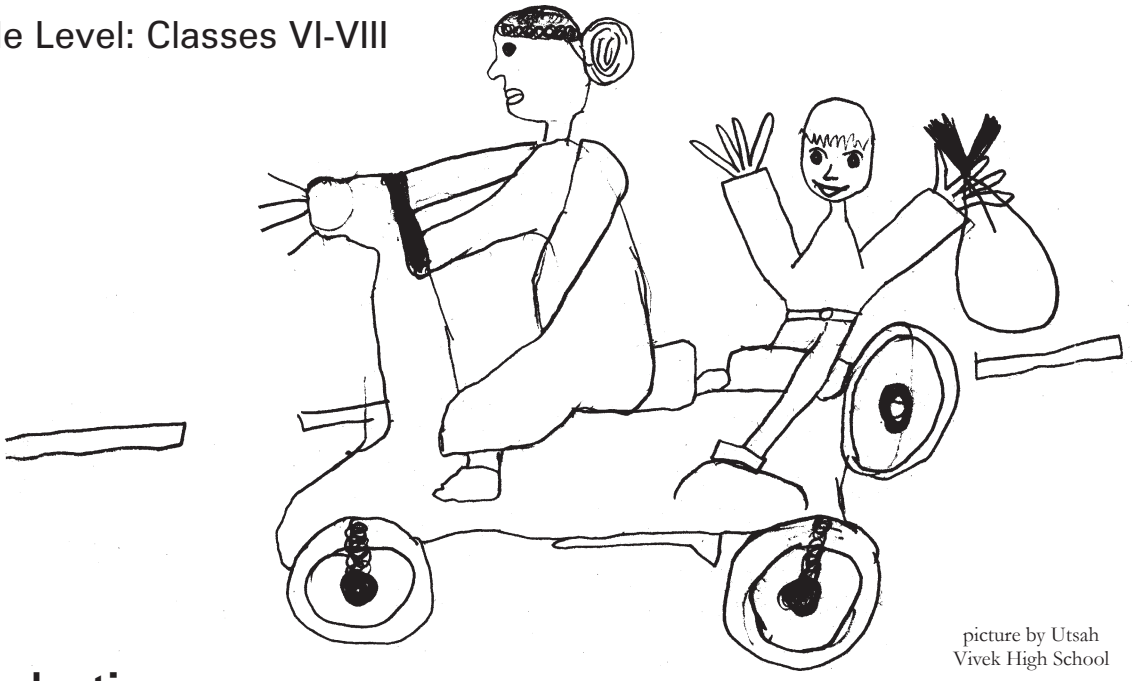
In the May, 2002 STL Workshop we tried to identify mosquito larvae in samples collected from stagnant pools and tanks. However, we did not find any larvae, perhaps because they were scarce at that time of year, or perhaps because the pools of water had been recently treated with insecticides. Most teachers did not know what mosquito larvae look like. Neither did they know that Anopheles mosquitoes, which can be readily identified, are the ones responsible for malaria transmission.

In August children from another school collected water samples from a Rose Garden pond that contained mosquito larvae. The samples were kept in closed jars for a few days and adult mosquitoes were then found trapped in the air at the top of the jars. With more careful observation perhaps they could have seen larvae, pupae, adults, and even eggs.

# If Rycle can Cycle and Save Money, Why Not Others?

**Renu Puri, Renu Sikka, Nidhi Gill, and Kamini Butalia**
**Vivek High School, Sector 38, Chandigarh**

Grade Level: Classes VI-VIII



picture by Utsah
Vivek High School

## Introduction

A growing problem in Chandigarh is the over crowding of the roads at peak school and office hours. To relate this problem to the economics of commuting, the students will estimate the cost of travel to school by different modes of transport. This will also be related to the environmental pollution being caused by different fuels.

## Science Concepts

1. Means of transport
2. Relationship between speed, distance and time
3. Measurement and its units
4. Types of fuel used
5. Pollution.

## Previous knowledge

1. Conversion and units of measurement
2. Kinds of transport
3. An idea of what speed is
4. Calculations involving money

## Teaching/learning material

Watches, City maps with distance scales

# Students' Guide

## Scenario

Michael asked Rycle "why are you late to school today?"

Rycle answered disgustingly, "Oh there was a big chaos at home in the morning. After I got ready for school and reached the backyard to get my bicycle, I discovered a flat tyre. The only alternative left was a request to my mother, but she refused to drive down to school during peak hours. I had to really talk her into driving me down this distance. On the way my mother asked me to calculate how much more money it has taken to reach school in a car."

## Your Tasks

1. Work in groups (of five students) find out how far is the school from each of your homes and also note the modes of transport you use to reach school.
2. For homework, find out the fuel you use, the cost per litre, and the amount of fuel used per km.
3. Estimate the usual time you take to get to school. (This should include the stoppages enroute).
4. Do the required calculations to estimate the cost of travelling to school each day.
5. Compile the results by making bar graphs and analyse the data to compare the costs of different modes of transport.

**Also discuss:**

How can you use alternative means of commuting so as to save on fuel and money?

Can sharing of different means of transport help?

## Parents' and Students' Handout

1. If you bring your child to school in a vehicle, discuss the fuel used, cost and average consumption of your vehicle.
2. if the child is using school transport, discuss the amount charged by the school .

Help your child fill up the first row of the following Table.

| Name of student | Mode of Commuting | Time Taken | Type of fuel | Cost/litre | Cost/km |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
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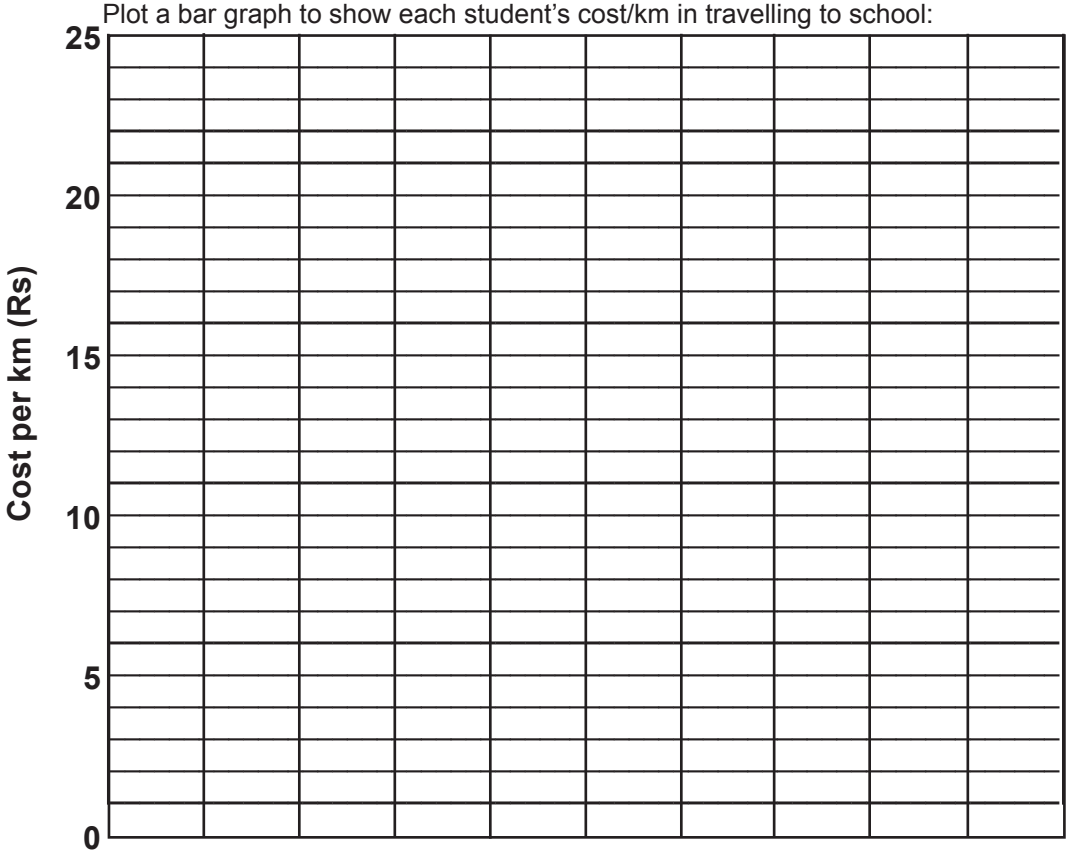
| | | | | | |

In class: Fill up the data for other students in your class.

## Students' Handout

Plot a bar graph to show each student's cost/km in travelling to school:



# Teachers' Guide

## Suggested Teaching Strategy

1. After reading or enacting the story, conduct a brain storming session on the advantages and disadvantages of travelling by different modes of transport.
2. The students should estimate the time they take to get to school and the distance from their home to school.
3. Ask the students to have their parents help them find out the cost of different fuels and the average distance/litre their vehicle gets. They should fill up the questionnaires.
4. The students should do the calculations to estimate the cost of travelling to school each day. They should also calculate the cost per km of the modes of transport that they use. Let the students work in their groups to figure out how to do the calculations (the teacher should not give them a formula). For older students, they may also want to take into account other expenses besides fuel, e.g. depreciation of the vehicle, etc).
5. The students' handout is to be given in which the students will graph the results of their findings, comparing the costs of different modes of transport.

## Suggested Additional Activities:

1. The line demonstration of a cyclist can be given on stage.
2. The question and results can be presented in front of the whole school in one of the assemblies.
3. The examples of some teachers also cycling down to school can be given.

# About the Script

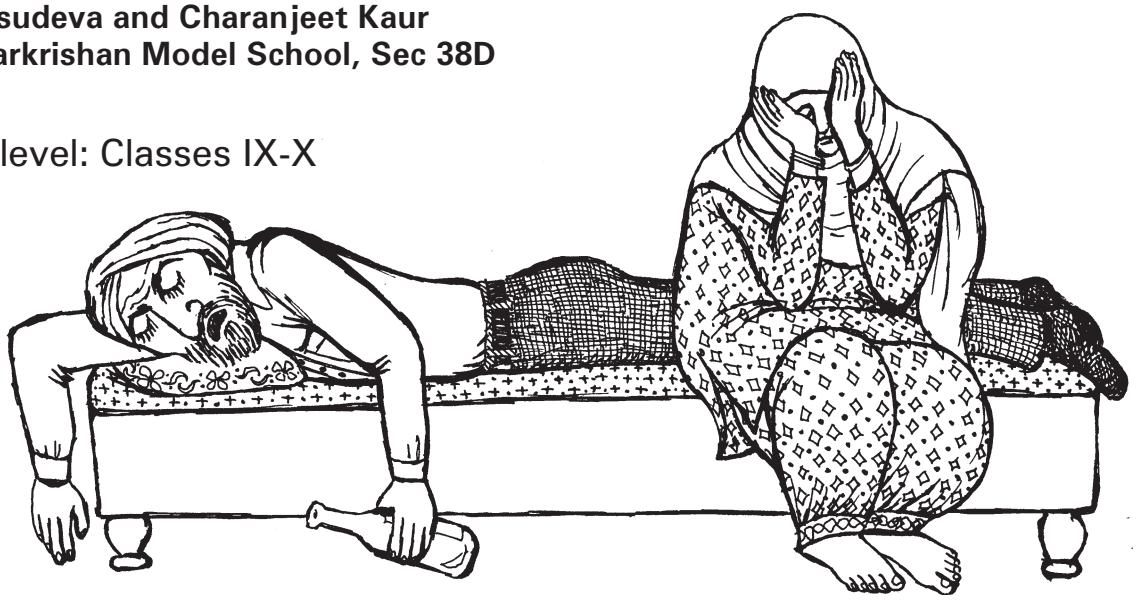
This script was tried out in the Science Club at Vivek High School. The students listed out the various modes of transport used to reach school and then calculated the amount spent on each. In order to do this, they had to estimate the distance, cost of fuel, and also consider a number of questions they had never thought of – should they calculate the cost per bus or per child?, cars make 4 trips and not two as they thought earlier, they also had to include overhead charges, etc. The calculations became very interesting. The group was asked to think of solutions to cut down the cost and reduce pollution, e.g. carpool, use of cycles, need of public transport in Chandigarh.

The script brought up a real concern about the rising pollution and the cost of travel in Chandigarh. It has highlighted the advantages and disadvantages of different modes of transport. It has enhanced the students' understanding of the different units of measurement, their conversion, and their use in our day-to-day life.

# Alcohol: End of Life

**Rita Vasudeva and Charanjeet Kaur**
**Guru Harkrishan Model School, Sec 38D**

Grade level: Classes IX-X



## Introduction

Many people in our society drink. This results in suffering due to accidents, liver problems, nervous disorders, etc. People take alcohol to enjoy their evenings, or to reduce their worries and tensions. But they may not realise that alcoholism can even be fatal. It is a social problem. People should be helped as early as possible to avoid excessive alcohol, because it is addictive and the physical harm increases with time.

Now it has been established that addiction is a disease. Without treating this disease, any other solutions like getting a job, getting married, getting financial aid, etc. will not help the addict to stop taking alcohol. In the process of treatment the patient gets help to totally stop taking alcohol. Such abstinence is essential.

## Science concepts

1. Alcoholism is a physical and mental disease, as well as a social problem.
2. The effects of alcohol on the human body.
3. The nature of addiction.
4. Alcoholism can be prevented, treated, and cured in various ways.

## Previous knowledge

Students are already aware of some bad effects of alcohol.

## Teaching/learning materials

1. Charts and pictures of diseased people showing which parts of the body are affected
2. Chart showing an accident due to drunkenness
3. Multimedia material and audio visual aids related to alcoholism
4. X-rays and/or scans of alcohol affected people

# Students' Guide

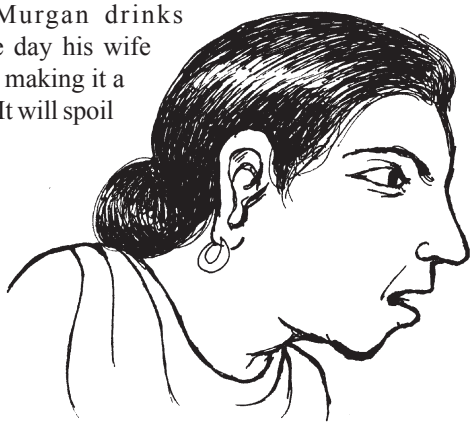
## Scenario:

Murgan is on his way back from the fields after receiving his wages. He had bought a pleasant surprise for his family. He was leading a happy family life.

One day his friend came from the city and Murgan was suffering from a cold. He offered Murgan alcohol as a medicine for the cold. Murgan felt very relaxed.

One day the next week he felt very tired and he decided to take a little alcohol, and then again he felt relaxed and sleepy.

Nowadays Murgan drinks regularly. One day his wife said, "You are making it a habit to drink. It will spoil your health!"



He angrily replied, "Don't irritate me! Let me sleep!"

The next day Murgan returns home after drinking a large amount of alcohol. Inspite of his drinking he managed to reach back home alright.

His wife says, "For the last two months you haven't given any money."

Murgan shouts at her and breaks the water pot.

The next morning Murgan asks for cold water. His wife says, "You broke the water pot last night, and don't act as if you don't know it!"

With this, family frustrations started.

One day Murgan's daughter falls sick. Murgan goes to call a doctor, but on the way he stops to take a drink. He really wants to stop with one drink but can't – he goes on – as he is now an addict.

# Your Tasks:

1. Enact the scenario.
2. Individually complete the handout, filling in the Table to show what effects of alcohol were shown in the story, and what effects you have seen or heard about.
3. Brainstorm on the problems of alcohol addiction.
4. Form groups and select the most important problems from the brainstorming.
5. Also discuss:
   (a) How a person becomes addicted
   (b) What steps we can take to avoid addiction.
6. Carry out a survey of how many people in your locality drink and why. Then discuss the results in class.
7. Have a class discussion on the problems of alcohol addiction.

## Student Handout

1. After enacting Murgan's story, fill up the following Table to tell how Murgan experienced the effects of alcoholism. Also tell how you may have seen someone you know experience these symptoms.

## Symptoms of Alcoholism:

| Symptom | As experienced by Murgan | As seen by me |
|---|---|---|
| Increased tolerance | | |
| Black out | | |
| Loss of control | | |
| Avoiding any reference to alcohol | | |

2. List five reasons why people drink.

3. Find out the names of common medicines that contain alcohol (these could be harmful if taken by babies and children, or by others if taken in large quantity).

# Teachers' Guide

## Suggested Teaching Strategy

1. Students will enact the scenario, and fill in the Table on Symptoms of Alcoholism in the Student Handout.
2. Conduct a brainstorming session on the symptoms and problems of alcohol abuse. Write the word ALCOHOL in a box in the middle of the blackboard, and then all the suggestions on symptoms and problems. It is important to include all the suggestions, even if they seem to be irrelevant or similar to each other.
3. Divide the class into groups to select the most important points from the brainstorming session. In doing this it is expected students will make comments on
   (a) How a person becomes addicted

   (b) What steps we can take to avoid addiction.

(It is not expected that their answers will be complete at this stage.)

In case the students do not come up with it themselves, the teacher can suggest ways to cure alcohol addiction:

- Medical treatment
- Lectures
- Group therapy
- Psychological treatment
- Motivating the addict to take treatment
- Education through poster exhibitions
- Teachers talking to parents
- Joining AA, Aloteen, or getting family members to attend such groups, and/or getting AA members to give talks to students.

The students may also prepare a poster exhibition and/or a slide show and/or a play to present information about alcoholism (it's cause, prevention, and treatment) to parents and others.

# Additional Information for the Teacher

Alcohol slows down the activity of the brain and the nervous system.

Alcohol starts acting as soon as we take the first sip. It is directly absorbed into the blood stream through the walls of the stomach and intestines. It circulates throughout the body, going with the blood to the brain and every organ including the heart, liver, and pancreas. When it reaches the liver, it is broken down (oxidized), finally being turned into $CO_2$ and $H_2O$.

## Affects of use of alcohol:

- Ruin of family life
- Affects in Industries: The problem of addiction may develop in any person – manager, supervisor, labourer, etc.
  If the supervisor or manager is a problem drinker, it results in:
  - Mismanagement of the budget
  - Lack of discipline
  - Confusing instructions to employees.

  If a labourer takes excessive amounts of alcohol, it results in:
  - Accidents on the job
  - Lack of concentration, leading to poor quality of work
  - Absenteeism leading to lowered productivity.
- Increase in crime: Under the influence of alcohol, e person looses control over his thoughts, judgement, actions, etc. He may become angry and aggressive, and may not even realise what he is doing. He may commit burglary to get money for buying alcohol.
- Cheating in business deals
- Becoming violent and fighting with people
- Suffering from hepatitis, cirrhosis of liver (in 10% of alcoholics)
- Increased risk of heart disease, high blood pressure, throat cancer, and impotence

Despite alcoholism being a serious problem, alcohol continues to be produced and consumed by people. Why?

There are certain social factors behind this:

- The alcohol industry provides employment to thousands of people.
- Taxes on the sale of alcohol bring in a large revenue for the government.
- Employers give alcohol to workers as part of their wages.
- Lorry owners encourage their drivers to drink alcohol before any long distance travel. They believe this will help the drivers to work for long hours at a stretch.
- Advertising
- Some people do manage to drink small amounts of alcohol without becoming alcoholics, and without it damaging their health – some studies have even shown that one drink a day may help people relax, avoid stress, and reduce the risk of coronary disease (but many people cannot limit their drinking to just one drink).

# About the Script

This script was tried out in a private school in Chandigarh with students of the middle and lower middle classes. While enacting and discussing the scenario and filling in the Table, it was interesting to note that some students were already aware of the ill effects of alcoholism because some of their parents were addicted to alcohol (and/or tobacco). They told their family stories and how the family gets affected economically and socially.

They also put up a presentation and poster exhibition for parents. They prepared Power Point presentations (assisted by the computer department), and gave slide shows.

By following this script, the students did get more information about addiction and alcoholism, increased awareness about how alcohol affects our body, and they found out possible ways to help people who have drinking problems and to prevent more people from getting addicted. Thus, it should help prevent and cure a major social problem.

# What Will Happen if a Nuclear Bomb Falls on Lahore?

**Karen Haydock**
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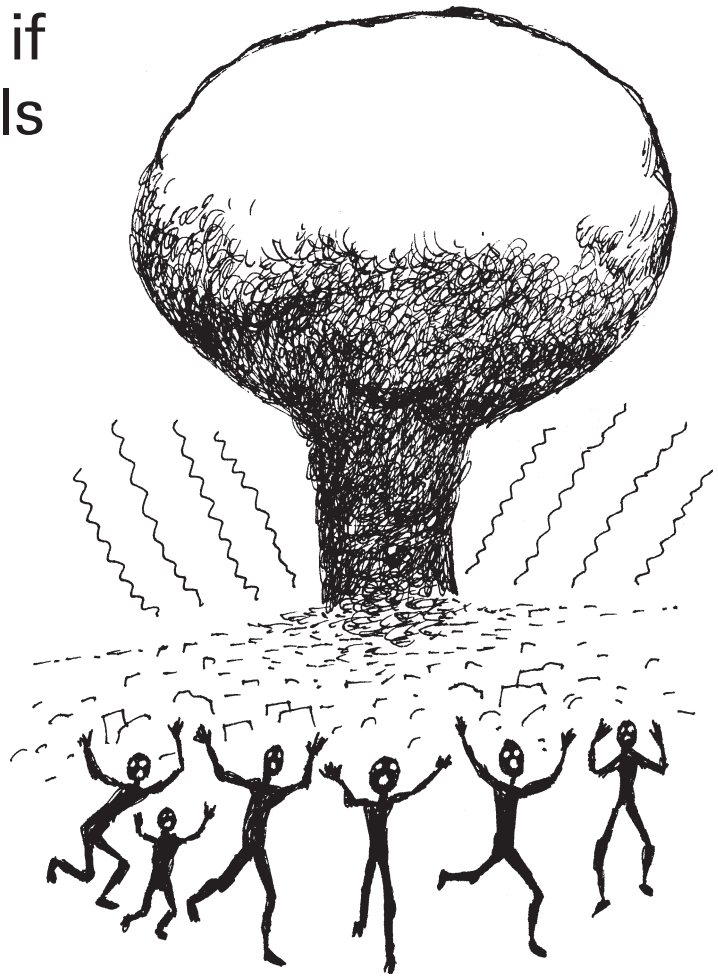
Grade level: Classes VIII-XI



## Introduction

Suppose a nuclear bomb exploded on Lahore – what would happen? What would happen to the people of Pakistan? What would happen to the people of India? What would happen to the environment? What are the economics of a nuclear weapons development program? Can nuclear weapons be good? Should we build nuclear weapons? In today's world these questions need to be considered as part of science and technology literacy.

## Science concepts

- What are nuclear weapons and how are they different from conventional weapons?
- Assessing the death and destruction caused by nuclear weapons

## Previous knowledge

The students should have heard of molecules and atoms

## Teaching/learning materials

Slides showing the effects of nuclear war

Access to libraries, newspapers, and the internet

# Students' Guide

## Scenario: Sadako by Eleanor Coerr

One morning in August 1954, Sadako Sasaki looked up at the blue sky over Hiroshima and saw not a cloud in the sky. It was a good sign. Sadako was always looking for good-luck signs.

Back in the house, her sister and brothers were still sleeping on their bed quilts. She poked her big brother, Masahiro. "Get up, lazybones!" she said. "It's Peace Day!"

Mashahiro groaned, but when he sniffed the good smell of bean soup, he got up. Soon Mitsue and Eiji were awake, too.

Rushing like a whirlwind into the kitchen, Sadako cried, "Mother, can we please hurry with breakfast? I can hardly wait for the carnival !" " You must not call it a carnival," her mother said. "It is a memorial day for those who died when the atom bomb was dropped on our city. Your own grand mother was killed, and you must show respect."

"But I do respect Obasan," Sadako said. "It's just that I feel so happy today."

At breakfast, Sadako fidgeted and wriggled her bare toes. Her thoughts were dancing around the Peace Day of last year - the crowds, the music, and the fireworks. She could almost taste the spun cotton candy. She jumped up when there was a knock at the door. It was Chizuko, her best friend. The two were as close as two pine needles on the same twig.

"Mother, may we go ahead to the Peace Park?" Sadako asked.

"Yes, Sadako chan," her mother answered. "Go slowly in this heat!" But the two girls were already racing up the dusty street.

Mr. Sasaki laughed. "Did you ever see Sadako walk when she could run, hop, or jump?"

At the entrance to the Peace Park, people filed through the memorial building in silence. On the walls were photographs of the ruined city after the atom bomb- the Thunderbolt- had instantly turned Hiroshima into a desert.

"I remember the Thunderbolt," Sadako whispered." There was the flash of a million suns. Then the heat prickled my eyes like needles."

"How could you possibly remember anything?" Chizuko exclaimed. " You were only a baby then."

"Well, I do !" Sadako said stubbornly.

After a speech by the mayor, hundreds of white doves were freed from their cages. Then, when the sun went down, a dazzling display of fireworks lit up the dark sky.

Afterward, everyone carried rice-paper lanterns to the banks of the Ohta River. Written on the rice-paper were the names of relatives and friends who had died because of the Thunderbolt. Sadako had Obasan's name on hers.

Candles were lit inside the lanterns. Then they were launched on the river, floating out to sea like a swarm of fireflies.

It was the beginning of autumn when Sadako rushed into the house with the good news.

"The most wonderful thing has happened!" she said breathlessly. "The big race on Field Day! I've been chosen to be on the relay team!" She danced around the room. "If we win, I'll be sure to get on the team next year!"

That was what Sadako wanted more than anything else.

From then on, Sadako thought of only one thing - the relay race. She practiced every day at school and often ran all the way home. Masahiro timed her with their father's big watch. Sadako dreamed of running faster. Maybe, she thought, I will be the best runner in the whole world.

At last the big day arrived. Parents, relatives, and friends gathered at the school to watch the sports events. Sadako was so nervous she was afraid her legs wouldn't work at all.

"Don't worry," Mrs. Sasaki said. "When you get out there, you will run as fast as you can."

At the signal to start, Sadako forgot everything but the race. When it was her turn, she ran with all the strength she had. Her heart thumped painfully against her ribs when the race was over.

It was then that a strange, dizzy feeling came over her. She scarcely heard when someone cried, "Sadako ! Your team won!" The class surrounded Sadako, cheering and shouting. She shook her head a few times and the dizziness went away.

All winter long, Sadako practiced to improve her speed. But every now and then the dizziness returned. She

didn't tell anyone about it, not even Chizuko. Frightened, Sadako kept the secret inside her. On New Year's Eve, Mrs. Sasaki hung good-luck symbols above the door to protect her family all through the year.

"As soon as we can afford it, I'll buy a kimono for you," she promised Sadako. "A girl your age should have one."

Sadako politely thanked her mother, but she didn't care about a kimono. She only cared about racing with the team next year.

For several weeks it seems that the good luck symbols were working. Sadako felt strong and healthy, and she ran faster and faster.

But all that ended one crisp, cold winter day in February when Sadako was running in the school yard. Suddenly everything seemed to whirl around her, and she sank to the ground.

Soon Sadako was in an examining room in the hospital, where a nurse took some of her blood. Dr. Numata tapped her back and asked a lot of questions.

Sadako heard the doctor say the word "leukaemia." That was the sickness caused by the atom bomb! She put her hands over her ears, not wanting to hear any more.

Mrs. Sasaki put her arms around Sadako. "You must stay here for a little while," she said. "But I'll come every evening." "The doctors want to take some tests, that's all," her father told her.

"They might keep you here a few weeks."

A few weeks ! To Sadako it seemed like years. What about the relay team?

When her family had left for the night, Sadako buried her face in the pillow and cried for a long time. She had never felt so lonely.

The next day, Chizuko came to visit, smiling mysteriously.

"Close your eyes," she said. Sadako held her eyes tightly shut, "Now you can look!"

Sadako stared at the paper and scissors on the bed. "What's that for?" I've figured out a way for you to get well," Chizuko said proudly. "Watch!"

She cut a piece of gold paper into a large square and folded it over and over, until it became a beautiful crane.

Sadako was puzzled " But how can that paper bird make me well?"

"Don't you remember that old story about the crane?" Chizuko asked. "It's supposed to live for a thousand years. If a sick person folds one thousand paper cranes, the gods will grant her wish and make her well again." She handed the golden crane to Sadako. "Here's your first one."

"Thank you, Chizuko chan," Sadako whispered. "I'll never part with it."

That night, Sadako felt safe and lucky. She set to work folding cranes, and Masahiro hung them from the ceiling. Why, in a few weeks she would be able to finish the thousand cranes and go home - all well again.

Eleven... I wish I'd get better...
Twelve... I wish I'd get better...

One day Nurse Yasunaga wheeled Sadako out onto the porch for some sunshine. There Sadako met Kenji. He was nine and small for his age, with a thin face and shining dark eyes.

Soon the two were talking like old friends. Kenji had been in the hospital a long time, but his parents were dead and he had few visitors. "It doesn't really matter," Kenji said with a sigh, "because I'll die soon. I have leukaemia from the bomb." Sadako didn't know what to say. She wanted so much to comfort him. Then she remembered. "You can make paper cranes like I do," she said, "so that a miracle can happen!" " I know about the cranes," Kenji said quietly. "But it's too late. Even the gods can't help me now."

That night, Sadako folded a big crane out of her prettiest paper and sent it across the hall to Kenji's room. Perhaps it would bring him luck. Then she made more birds for her own flock.

One hundred ninety-eight...I wish I'd get better...
One hundred ninety-nine...I wish I'd get better...

One day Kenji didn't appear on the porch, and Sadako knew that Kenji had died.

Late that night, Sadako sat at the window, letting the tears come. After a while, she felt the nurse's gentle hand on her shoulder. "Do you think Kenji is out there on a star island?" Sadako asked.

"Wherever he is, I'm sure he is happy now," the nurse replied. "He has shed that tired, sick body, and his spirit is free." "I'm going to die next, aren't I?" "Of course not!" Nurse Yasunaga answered with a firm shake of her head. "Come, let me see you fold another crane before you go to sleep. After you finish one thousand, you'll live to be an old, old lady." Sadako tried hard to believe that. She folded birds and made the same wish. Now there were more than three hundred cranes.

In July it was warm and sunny, and Sadako seemed to be getting better. "I'm over halfway to a thousand cranes," she told Masahiro, "so something good is going to happen." And it did.

Her appetite came back and much of the pain went away. She was going to get to go home for O Bon, the biggest holiday of the year. O Bon was a special celebration for the spirits of the dead who returned to visit their loved ones on earth.

Mrs. Sasaki and Mitsue had scrubbed and swept the house, and the air was filled with smells of delicious

holiday food. Dishes of bean cakes and rice balls had been placed on the alter. After they had eaten, Eiji handed Sadako a big box tied with a red ribbon. Slowly Sadako opened it. Inside was a silk kimono with cherry blossoms on it. Sadako felt hot tears blur her eyes. " Why did you do it?" she asked, stroking the soft cloth. "Silk costs so much money." "Sadako chan," her father said gently, "your mother stayed up late last night to finish sewing it. Try it on for her."

Mrs. Sasaki helped her put on the kimono and tie the sash. Everyone agreed that she looked like a princess. Sadako let out a happy sigh. Perhaps - just perhaps - she was home to stay.

But by the end of the week Sadako was weak again and had to return to the hospital. The class sent her a Kokeshi doll to cheer her up. Sadako placed it on the bedside table next to the golden crane.

For the next few days, Sadako drifted in and out of a strange kind of half- sleep. Her parents sat beside the bed. "When I die," she said dreamily, "will you put my favourite bean cake on the alter of my spirit? And put a lantern on the Ohta River for me on Peace Day?" Mrs. Sasaki could not speak. She took her daughter's hand and held it tightly. " Hush!" Mr. Sasaki said. "That will not happen for many, many more years. Don't give up now, Sadako chan. You have to make only a few hundred more cranes."

As Sadako grew weaker, she wondered, Did it hurt to die? Or was it like falling asleep? Would she live on a heavenly mountain or star? She fumbled with a piece of paper and clumsily folded one more bird.

Six hundred and forty four...

Her mother came in and felt her forehead. She gently took the paper away. As Sadako closed her eyes, she heard her mother whisper, " O flock of heavenly cranes, Cover my child with your wings."

When she opened her eyes again, Sadako saw her family there beside the bed. She looked around at their faces and smiled. She knew that she would always be a part of that warm, loving circle.

Sadako looked up at the flock of paper cranes hanging from the ceiling. As she watched, a light autumn breeze made the birds rustle and sway. They seemed to be alive, and flying out through the open window.

Sadako sighed and closed her eyes. How beautiful and free they were.

Sadako Sasaki died on October 25, 1955.

Her friends and classmates worked together to fold 356 paper cranes, so that she would be buried with one thousand. In a way, she got her wish. She will live on in the hearts of all the people who hear her story.

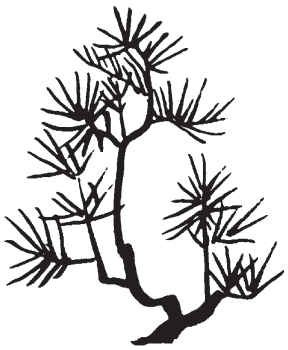
The class collected Sadako's letters and writings and published them in a book called Kokeshi, after the doll they had given her. A Folded Crane Club was organised in her honour.

Sadako's friends began to dream of a monument to her and all the children who were killed by the bomb. Young people throughout the country helped collect money. They wrote letters and shared Sadako's story. Finally, in 1958, their dream came true.

Now there is a statue of Sadako in Hiroshima Peace Park. She is standing on the Mountain of Paradise, holding a golden crane in out-stretched hands.

Every year, on Peace Day, children hang garlands of paper cranes under the statue. Their wish is engraved at its base:

This is our cry,
this is our prayer:
Peace in the world.

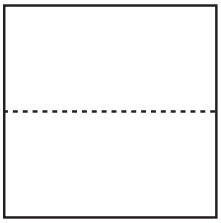


## Your Tasks:

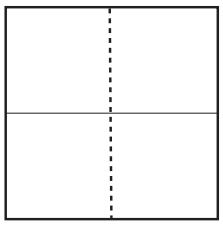
1. Read the story of Sadako.
2. Make paper cranes [see Handout].
3. Listen to the slide show, "It Could Happen To Us".
4. Work in groups, using the library and the internet to find out:
    a. What are the differences (in terms of both design and effect) between conventional and nuclear weapons?
    b. What is the size of the nuclear bomb that was dropped on Hiroshima, and what are the sizes of nuclear weapons available these days?
    c. If a medium-size nuclear bomb was to fall on Lahore what would happen? (First decide on exactly what is meant by 'medium sized'.)
        i. On a map of South Asia, draw circles to show the size of the area in which all people would die immediately, the area in which most buildings would be destroyed and most people would be hurt, and the area in which radiation would have a substantial effect. (Also consider the effects of wind and different weather conditions.)
        ii. Estimate how many people would die immediately and after some time due to the bomb.
        iii. Discuss and estimate what the effect on Chandigarh would be.
    d. Find out how much India has spent on developing nuclear weapons. Suppose the same amount had instead been spent on schools or hospitals – how many schools or hospitals could be built and kept running?
    e. Which countries spend the most money on nuclear weapons?
5. Each group will then present their findings to the rest of the class.
6. The whole class should brainstorm on the good and bad things about nuclear weapons, and then discuss whether nuclear weapons should be built.
7. Discuss in small groups how we could stop nuclear war. Then discuss in the whole class.

# MAKE A PAPER CRANE

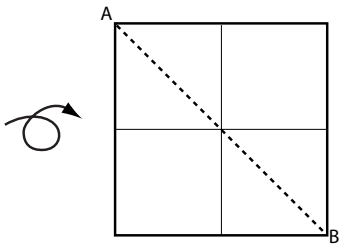
Use a square piece of a thin paper (a 20 cm square of old newspaper works fine).



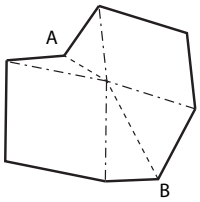
1. Fold in half and unfold, to get a crease.



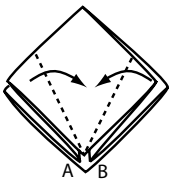
2. Fold in half the other way, and unfold.



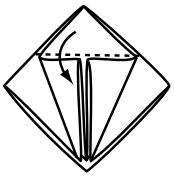

3. Turn the paper over and fold on the diagonal.



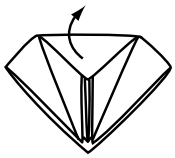

4. Push the centre up while bringing all four corners together, with A and B in between.



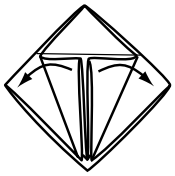

5. With A and B at the bottom, fold the top layer on each side in to the centre.



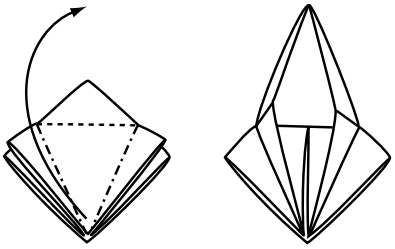
6. Fold the top triangle down.



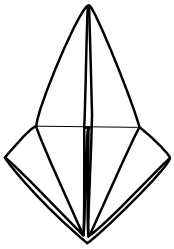
7. Unfold the top triangle.



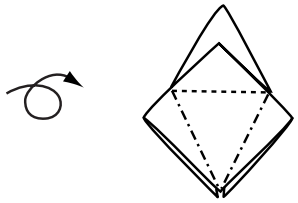
8. Unfold the two side flaps.



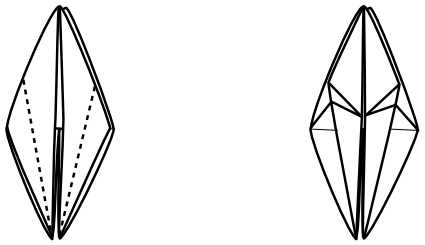
9. Raise the bottom point (top layer only), making a valley fold along the horizontal line, and allowing the sides to come together.



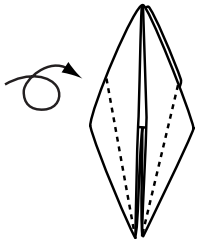
10. Flatten the trapezoid



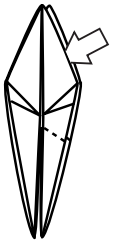
11. Turn over and repeat steps 5 - 10 on the other side.



12. Notice that the bottom of the resulting trapezoid is split. Fold the sides to the centre (top layer only).

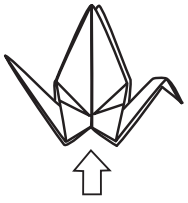


14. Turn over and fold the sides to the centre.



15. While opening slightly at the arrow, inside-reverse fold to bring the neck up from inside.

16. Now, inside-reverse fold to bring the tail up. Also, inside-reverse fold to bring the beak down.



17. Pull the wings slightly apart while gently blowing to inflate the body.

# Teachers' Guide

## Suggested Teaching Strategy

1. Read the story and/or present the slide show, "It Could Happen To Us" (available on CD). For younger children, we suggest you read the story but do not present the slide show, since some material in the slide show may be too disturbing.
2. Ask the students to work in groups, using the library and the internet to find out answers to the questions given above in Your Tasks. You may give the students the following hints:
    a. The sizes of bombs are measured by comparing their explosive power to the explosive power of TNT.
    b. You need to estimate the current population in different parts of Lahore, Pakistan, and India based on published census data.
    c. When considering the effect of a nuclear bomb, consider all kinds of effects: deaths injuries and resulting sicknesses of people and other animals, destruction of buildings, railroads, bridges, roads, forests, farms, long term effects of radiation, congenital birth defects, and other economic, political, social, psychological, religious effects.
3. Each group will then present their findings to the rest of the class.
4. The whole class should brainstorm on the good and bad things about nuclear weapons, and then discuss whether nuclear weapons should be built. While brainstorming, try to get the students to think of all possibilities, even outlandish ones. Later, in the discussion, the validity of points brought up during the brainstorming can be debated. The teacher can at times play the 'devil's advocate' in order to get the students to think deeper.
5. Discuss in small groups how we can prevent nuclear war. Then discuss in the whole class. Should the ideas be followed by action?

## Additional Activity

If desired, after reading the story of Sadako, you can teach the children how to fold paper cranes (the method can be found in many books on Japanese paper folding, or origami).

## About the Script:

I read the story of Sadako to a group of about 30 boys from Classes 6, 7 and 8 in an elite convent school in Chandigarh. Then I guided through the process of folding paper cranes.

Then we had a discussion. I asked the children why we read the story and why we folded the cranes. They said that we have to remember what happened, and we have to know how bad atom bombs are, so that we can have world peace.

Then, after some more similar discussion, I asked them, "So, after hearing the story of Sadako, how many of you think that India should drop an Atom Bomb on Pakistan?"

Immediately, more than half of the boys raised their hands, waving proudly, and shouting out, "Yes! Yes! Bomb them!"

So I asked, "Don't any of you have any cousins there?....Don't you think there are also children in Pakistan who are just like you?.....Don't you think there might be any Sadako's in Pakistan?"

But even then, the boys answered, "But if Pakistan had done something bad, then it would be alright to kill their Sadako's."

One boy was laughing with a real mean glint in his eyes, saying gleefully, "Smash them!!!" [Should we be thankful that at least this child is honest in communicating his feelings? An educated adult scientist/politician from the US may think similarly about 'the enemies', but may instead phrase his or her response in terms like, "It is unfortunate that there may be some collateral damage but we must fight a war on terrorism the peacekeeping force and nuclear deterrence a terrorwar on peace force the civilized world and democratic nuclear shield...." – spoken while stuffing their pockets with the profits of the arms business and continuing to train and fund Osama's in Asia.]

Another boy said, with (false) authority, "It is not true that if we attack Pakistan with a nuclear bomb, we will also feel the affects in India." Interestingly, no one in our discussion had yet brought up this possibility. Are his parents the ones who have misguided him? Or his teachers?

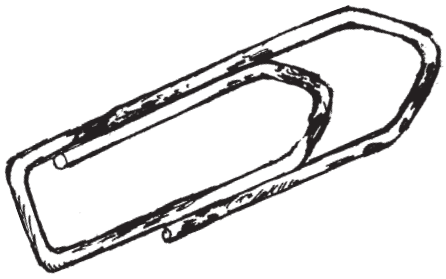
Certainly there is a need to continue with the activities suggested in the Script, but we were not able to do so at that school because of limited time.

I wonder if 'uneducated' children would respond in the same way. What about children in schools that are not so elite? We will try this in other places.

The slide show has been presented to other groups of students but the full script has not yet been tried out.

# Corrosion of Metals

**Ravinder Kaur and Mamta Mehta**
**GHS Sector 40A**



Grade Level: Class VII and VIII

Introdumportant role in today's life. Modern life without metals is impossible. Metals are obtained from various mineral ores found in the earth's crust (e.g. hematite is an ore of iron, copper glance is an ore of copper and bauxite is an ore of aluminium). Different metals have different properties like hardness, conductivity etc. But all metals share some common physical properties like hardness, tensile strength, conductivity, malleability and ductility. When some metals are kept exposed to air a layer of a particular colour forms on their surface.

## Educational Objectives

1. Observe and identify rusted and corroded metals of different types.
2. Find out which materials corrode and rust.
3. Find out under what conditions metals rust and corrode.

## Science Concepts

1. When kept in the open metals may get corroded or rusted.
2. Corrosion and rust can cause machines to stop working properly.
3. The rates of corrosion depend upon many factors.
4. Corrosion can be prevented in many ways.

## Previous Knowledge

Students must have observed the different coloured layers on different metals.

## Teaching/learning materials

1. Objects from different places made of different metals and other materials
2. Test tubes
3. Cotton wool
4. Hydrous calcium chloride
5. Boiled water
6. Unboiled water
7. Iron nails
8. Oil and other liquids

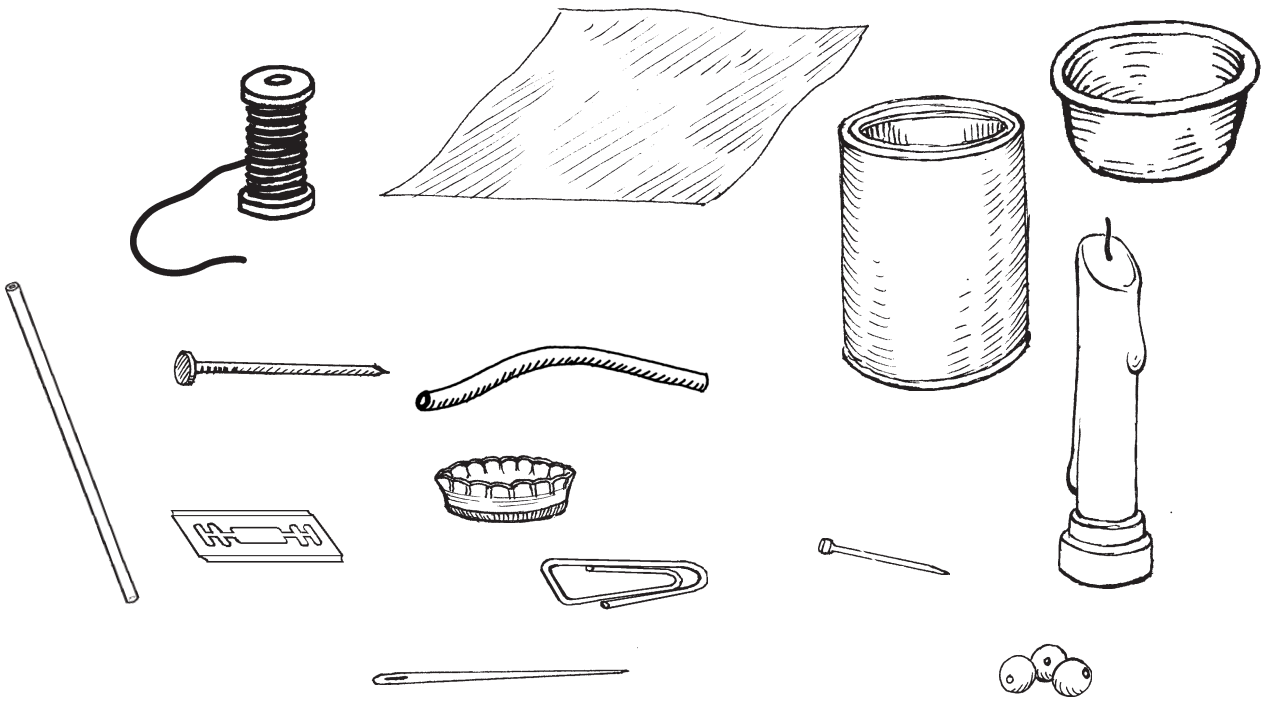
# Students' Guide

## Scenario

Sunny and Munny are twins. Sunny keeps his things carefully, while Munny doesn't. On their birthday, their parents presented them with brand new bicycles. Sunny always kept his cycle in the garage while Munny usually kept his cycle out in the open. Both were painting the town red on their bicycles. A couple of months passed by without any complaints. But soon Munny complained of heaviness while peddling his cycle and that it was becoming difficult to even move his cycle, unlike Sunny's. Then Munny realized that a reddish brown coloured layer had been deposited on some parts of his cycle.

# Your tasks

1. Collect from home various articles made from different metals and other materials, like jewellery, iron nails, copper coins, a stainless steel plate or spoon, aluminium wire etc. Make sure that some of these articles have been kept away from moisture, and others have been kept for a long time in damp places.
2. Examine the objects and sort them into sets according to what they are made of and whether or not they have rust or corrosion.
3. Conduct some experiments in small groups in class to find out the best and worst conditions for rusting. For example, you might put some iron nails in three glasses of water and keep them under the same conditions for two or three days or longer. Or some nails could be kept completely under water, others sticking halfway out of the water, and others kept without water. Observe the changes in the nails periodically. You might also try keeping some nails under other conditions for comparison – e.g. put some in other liquids like oil, lemon juice or in boiled water.
4. Observe any metal objects such as heavy machinery lying in the open.



## Student Handout

1. Working in small groups, use the following Table to document your observations of the objects you have brought, noting what you think they are made of and whether or not they are corroded.

| No. | Object | Where was it found? | What is it made of? | Is it corroded? | Colour of deposit (if present) |
|---|---|---|---|---|---|
| | | | | | |
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2. Sort the objects into different kinds of sets, for example:

   ·those that are made of the same material (which material?)

   ·those that have the same kind of rust or corrosion

   ·those that were found in similar places (which kind of place?)

   ·any other property you want

3. Record what sets you have made and which things you have put in each set. Then show the rest of the class what your group has found.

# Teachers' Guide

## Suggested Teaching Strategy

1. Students will enact the script and the teacher will tell the students that they will do some activities related to the following:
    - Causes of corrosion.
    - Factors responsible for rate of corrosion.
    - Different methods to control corrosion.
2. Students will examine the various objects they have brought from home to see which ones have rust or other forms of corrosion. They should fill up the Table in the Student Handout. They should also sort the objects in a number of ways: e.g. based on what they are made of, where they were found, or whether they are corroded.
3. The concept of corrosion can be explained by stating that it is the deposit of a layer of a particular colour on a metal for instance:
    - The deposit on copper is green.
    - The deposit on silver is black.
    - The deposit on iron is reddish brown.
4. Corrosion of iron is called rusting. Unused machines in factories, rusted ships in a dockyard, and old monuments, ornaments, and utensils all can be examples of the corrosion of metals.
5. The students can conduct experiments in the class to show factors responsible for the corrosion of metals. For example, they can take four test tubes and put some iron nails in each tube. In the first tube add hydrous calcium chloride (which collects moisture, keeping the air dry), to the second add boiling water, to the third unboiled water, and leave in the last tube as it is. Close these tubes with cotton wool. After a few days, observe whether the nails have rusted. Thus, the students should be able to find out what are the best and worst conditions for rusting.
6. Have a brain storming session and let children come up with all the factors that prevent the corrosion of metals. They can refer to their previous observations of corroded and uncorroded objects. They might mention:
    - Periodically greasing a cycle
    - Keeping machines properly oiled
    - Frequently painting grills fixed in windowpanes.
7. The teacher can explain different methods of controlling corrosion. The definition of an alloy and the constituents of different alloys can also be explained to the students.About this Script

# About the Script

This script investigates the conditions under which rusting takes place and also its prevention. The teacher had asked the students to bring rusty items to class. The items were displayed and the students told where they had found them.

They could also have brought items that were not rusty for comparison. Then they could discuss why some things rusted and other things did not.

The children experimented with boiled water to see if it prevented rusting. They kept some iron objects in water that had been boiled and others in water that had not been boiled. Boiling the water did not prevent the objects from rusting. Nevertheless, the experiment was a good learning experience for the children. They learnt that iron rusts where there is moisture.

Children also brought information about how the remains of Titanic were totally rusted after lying for decades at the bottom of the ocean. (Was this really rust, or some other form of corrosion? If it was not rust, why had the objects not rusted – or not completely rusted? More research on this point should be done.)

# How Can We Make Stronger Buildings?

**Karen Haydock, Kasturi Rangan**
**TII/45 Sector 25 and Delhi University**

Grade level: Classes V-VII

## Introduction

In an earthquake, we find that some buildings fall down or are damaged while others are not. What are some basic building methods that will result in strong structures?

## Science concepts

1. Experimenting with building designs
2. Devising experimental methods to test the strengths of structures
3. Comparing the strengths of different construction designs

## Previous knowledge

No particular knowledge of construction methods is necessary.

## Teaching/learning materials

Building materials such as stones, mud, blocks, paper, cardboard, sticks, pieces of wood, plastic, etc.

String, Glue, tape, etc.

# Students' Guide

## Scenario

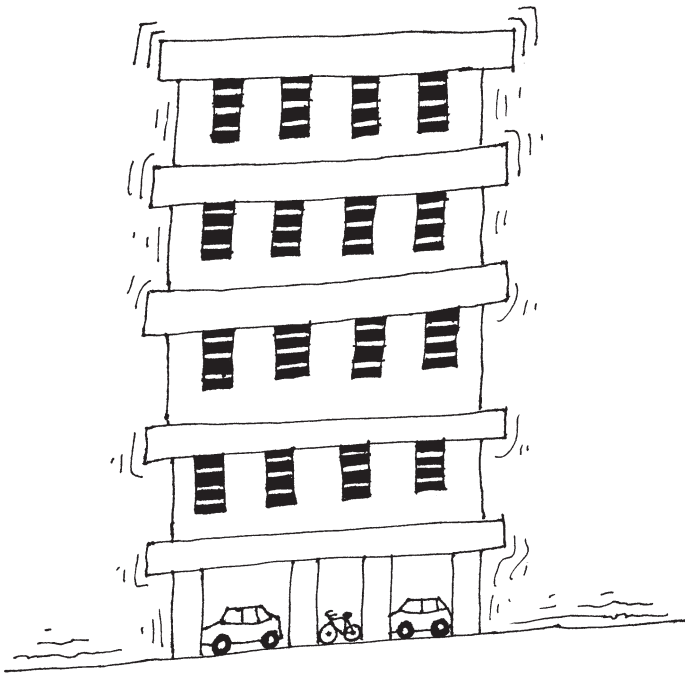
Simran and her mother were going back home to Bhuj after their stay with relatives in Haryana. On the train Simran's mother started talking to the other passengers who were sitting in the same compartment. After finding out that Simran and her mother lived in Bhuj, they started talking about the earthquake that had occurred there a few months before.

Simran said, "Everything started shaking. We ran down the stairs and out into the street. A big house down the street where Bimu lives fell down."

"Aaccha?" another passenger replied.

"Simran has missed so much school. You much finish learning your science, beta," Simran's mother said as she reopened the science book for Simran.

Simran started reading the book and her mother leaned forward and spoke in a low voice to the passenger, "It was very bad - we haven't told her yet what happened to her friend Bimu. The house fell on the whole family. Our house was spared."



In the Gujarat earthquake of 2001 some buildings were damaged and others were not. In some cases one building was completely damaged while another building next to it was completely undamaged. Could this be due to the different designs of the buildings? Can we learn to design buildings that will not be destroyed in earthquakes?

# Your Tasks

1. Read the story out loud, with expression and action. What questions does the story raise in your mind?
2. Using the materials your teacher has given you, or using whatever materials you can find around the school grounds, construct some structures and compare which ones are strongest, as shown in the Student Handout. You will have to work with those in your group to design the structures and devise fair tests of their strength. Carefully record your guesses (before you test) and your results (after you test). Then write down the conclusions your group reaches.

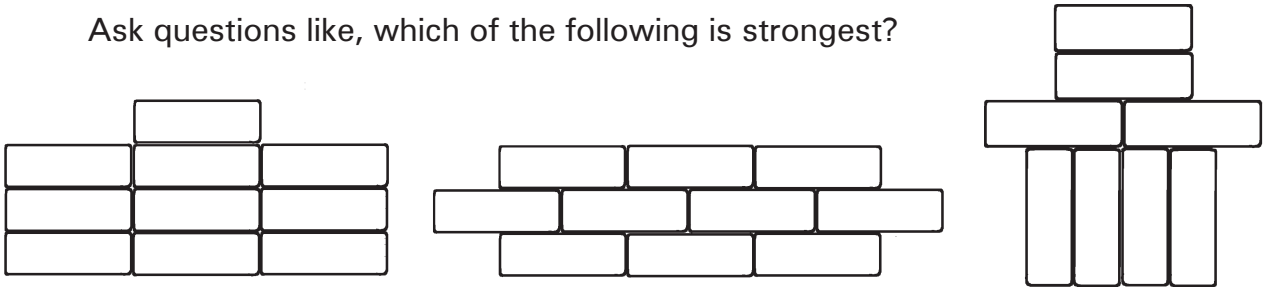
## Student Handout

Do one or more of the following:

1. Using just one piece of paper, who can make a bridge or roof that will support the most weight?

2. Use blocks to build two different structures on a board. Compare which ones are best able to withstand jiggling of the board.

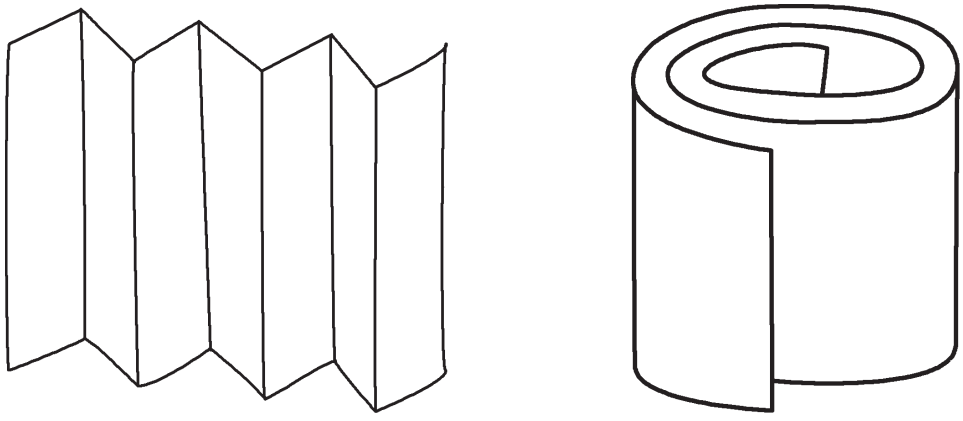
   Ask questions like, which of the following is strongest?



**A** **B** **C**

3. Using only one piece of paper, who can make a structure that will hold 3 Science textbooks 5 cm off the ground?

4. Which of the following structures can support more weight on top? Devise a way to make a fair test (e.g. (such as by stacking books on top), and find out. Record your results.



5. Consider questions such as:

   - Which are more earthquake proof: rigid buildings or flexible buildings?
   - Should very tall buildings be banned in earthquake prone areas?
   - Are traditional or modern  building methods better?

# Teachers' Guide

## Suggested Teaching Strategy

1. Ask the students to read the story out loud, with expression and action. Ask them what questions arise in their minds after reading the story. Ask whether they think buildings can be built to withstand earthquakes, and if so, how.
2. Divide the class into small groups of about 4 students each. Assign one or more of the activities given in the Student Handout. (All the activities need not be done.) Tell the class that they will have to work together to design structures and to devise fair tests to compare the strengths of the structures. Do not tell them how to do these things – let them find out for themselves. Allow enough time so that they can thoughtfully carry out their work, and repeat and modify their methods if needed.
3. Have a class discussion in which each group explains what they did and what their conclusions were. Compare the work done by different groups and encourage the students to ask each other questions.

The tasks in the Student Handout are given as examples, you can think of other activities using other materials to encourage the students to experiment and find out for themselves which construction methods are best. They need not use expensive materials. Mud, sticks, and stones might be the best materials.

# About the script:

When we first thought of the idea for this script (in the Delhi Dec 2001 Workshop), some people were sceptical, saying that children will not be able to design and invent good building methods on their own.

For example, they argued that if a child was asked to use a piece of paper to build a bridge between two piles of books that would be able to support a lot of weight, the child would not be able to invent good designs without help.

So, we found a child (of about 10 years old), gave him 2 pieces of paper and asked him to use it to build a bridge that would hold a lot of stones. We left him alone outside, secretly watching from a window to see what he would do. He tried out a number of ideas. He tried setting the paper in the long direction or in the short direction. He tried putting stones on the ends of the bridge for support. He tried folding the paper in different ways. Finally he made a bridge that had sides folded up several times and he reported that this design was able to hold the maximum weight. We felt that this exercise had been useful – the child had used the scientific method of guessing, designing, testing, observing, reguessing, retesting, etc. He was ready to challenge the guidelines, question his suppositions, and be creative, without needing someone to instruct him.

Later on, this script was tried out by the adult participants in the February Chandigarh Workshop. We gave them the same task that we had given the boy in Delhi: to make a strong bridge using a piece of paper. There happened to be a few teachers in the Workshop who had heard that a paper folded into an accordion shape can support the maximum weight. So they immediately made their bridge like that, then sat back and waited for the others to finish. Gradually the other teachers noticed what they had done and also made accordion bridges. When it was time for them to report on what they had made, everyone showed only the accordion type bridges (even though in the beginning I had noticed a few other designs). Some of the teachers also did not seem to be very creative in trying to figure out whether different accordion designs would give different results.

This shows that this activity may be best for people who are not already familiar with strong building methods. Most probably it will work better for children than for adults, keeping in mind that the objective is to experiment, not just to remember what kind of building is strongest.

# Is All Water Safe for Drinking?

**Shubhlaxmi, Neerja, & Sarabjeet Kaur**
**GHS Sector 41-A, and GHS Sector 22C**

Grade level: Classes VII-VIII

## Introduction

Water is one of the most basic necessities of life. It is obtained from different sources. Water meant for drinking should be transparent colourless and odourless. In cities, people depend mainly on tap wate In villages, other sources of water, like rivers ponds and even pools of ra water are sometimes used for drinking. A natural pond is a self regulat system, i.e. it has methods of detoxifying pollution at a low level, b various organisms present in it. But ponds these days are under c threat. The water from these sources may not always be fit for consumption.

Water that seems pure may contain a large number of dissolved impurities and millions of microscopic living organisms. This polluted water can be a source of diseases like diarrhoea, cholera, typhoid and infestation by worms, etc, It is important to find out how people can best use the water and determine whether their drinking water is really safe for drinking.

## Science Concepts

1. Understand what is meant by safe water
2. Methods that can be used to purify water
3. Learn about the pollution of water
4. Understand the process of purification of water by boiling
5. Understand different processes like filtration, decantation, evaporation, and distillation involved in the purification of water

## Prior Knowledge

1. Sources of water
2. Water borne diseases
3. Purification of water

## Teaching Material

1. Water from different sources like tap, river, pond, lake
2. Filter paper, pH paper
3. Microscope and magnifying glass
4. Chart showing diagrams of different sources of water
5. Burner or spirit lamp for heating purposes
6. Test tubes, conical flasks, pipette, burette and identification slips
7. Thermometer to record temperature

# Students' Guide

## Scenario

Vikas is a ninth class student and has been absent from school since the last three days. He is the main participant in the cultural programme being organized for the tenth class farewell. On inquiring his friends found out that he is suffering from typhoid. He has been advised bed rest for fifteen days and has been asked not to eat fatty food. His class mates report his illness to their class teacher. The class discusses with the teacher possible reasons that can lead to typhoid. Their teacher informs the students that typhoid is a disease which is caused mainly by drinking polluted water. The class discusses the methods of purifying water so that they do not fall ill like their classmate.

# Your Tasks

1. Collect samples of water from different sources like a tap, river, pond, lake, stream, etc. Observe the colour, transparency, and smell of each water sample (see Student Handout 1).
2. Test the water samples you collected for suspended impurities (see Student Handout 2), and dissolved impurities (see Student Handout 3),
3. Purify some water samples by filtration (see Student Handout 4), and decantation (see Student Handout 5).
4. Discuss whether particular samples of water are safe for drinking.
5. Educate your community / locality through posters about the need to keep water fit for drinking

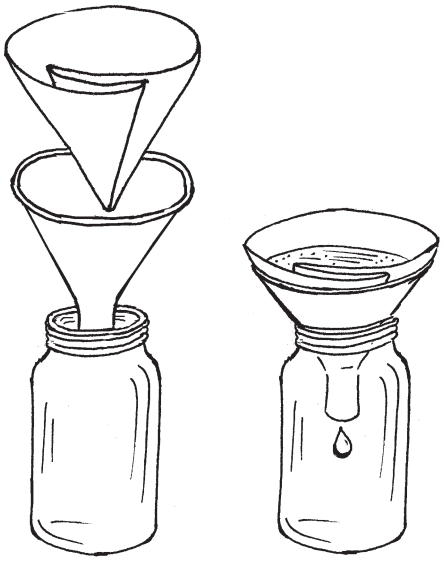
# Student Handout 1: Test for purity of water.

Pure water is colourless, tasteless, odourless and transparent.

Collect samples of water from the tap, river, pond, lake and rain water, and record your observations of them in the following Table.

| Properties | Water From Different Sources | | | | |
|---|---|---|---|---|---|
| | Tap | Pond | Lake | Rain Water | River |
| Colour | | | | | |
| Transparency | | | | | |
| Smell (Odour) | | | | | |

# Student Handout 2: Test for suspended impurities in water.



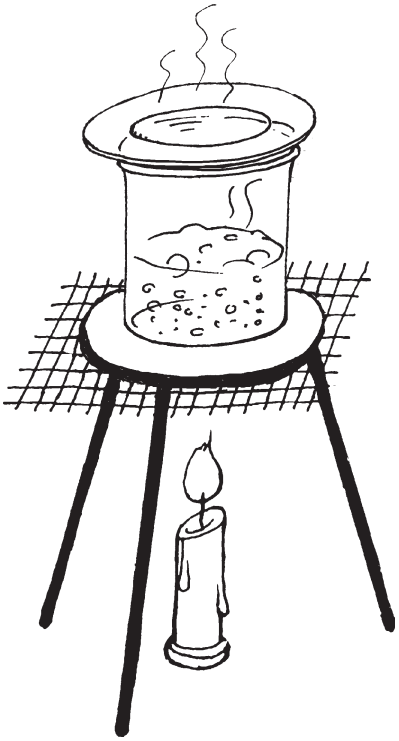
Water may contain dissolved salt besides suspended particles and other impurities.

Find out if any suspended impurities are present in a few different water samples, i.e. in tap water, river water, rain water, lake water and pond water.

Take a funnel and place it over a beaker or jar. Place a filter paper in the funnel to trap the impurities present in the sample. Observe the filtrate and the residue in the container as well as on the filter paper. Record your observations.

| Source of Water | Impurities Present | | | |
|---|---|---|---|---|
| | In the Container (Suspended) | | On the Filter Paper | |
| | Colour | Smell | Colour | Smell |
| Tap | | | | |
| Pond | | | | |
| Lake | | | | |
| Rain Water | | | | |
| River | | | | |

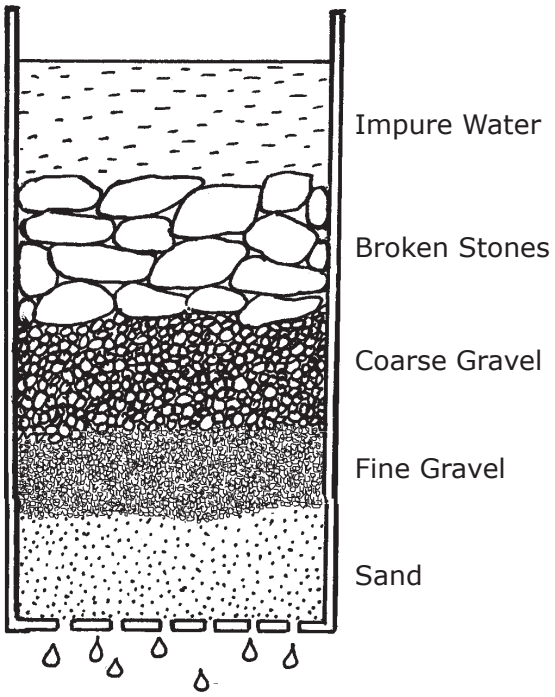
## Student Handout 3: Test for dissolved impurities in water



Investigate if any dissolved impurities are present in the samples of water collected from different sources.

Take a large, clean clock-glass filled with the water sample to be tested and place it over a beaker containing gently boiling water. When the water is in the clock-glass has completely evaporated, remove it and hold it against a sheet of paper. A number of opaque concentric rings of solid material may be seen on the clock glass. These are the deposits of solids that were present in the water in the dissolved state. These solids separated out at the periphery of the water in the clock glass as it gradually evaporated.

Rain water and distilled water should not leave any solid residues. This is because rain is a sort of naturally distilled water. It does not contain any dissolved solid matter although it contains dissolved gases from the air, mainly CO2, oxygen and nitrogen.




## Student Handout 4: Filtration of water.

In Student Handout 2 you separated suspended and other un-dissolved impurities. Now take an earthen pot or other container and make a water filter by filling it with sand gravel and large stones in layers as shown in the diagram. You will need a few holes at the bottom of the filter for getting the filtered water. Take the help of your teacher in making the sand filter.

You can also try cleaning water by adding $KMnO_4$ or chlorine.

## Student Handout 5: Decantation

Take water in a glass tumbler. Leave it undisturbed for sometime. You will observe that the heavy undissolved impurities have settled at the bottom. Pour the water slowly into another tumbler, so that the impurities at the bottom remain in the first container. This process is called decantation.

# Teachers' Guide

## Suggested Teaching Strategy

1. Read the scenario and hold a brainstorming session on the reasons that can lead to someone getting typhoid. (Also mention that there are inoculations to protect against typhoid.)
2. Discuss ways and means of purifying water for drinking purposes and help the students to carry out different activities for testing the purity of water.
3. Ask the students to purify water by decantation, and by making a filter, using sand, gravel, and stones.
4. Lead a class discussion on how people can best get safe drinking water.
5. Ask the students to make posters and charts to show others what they need to know about clean drinking water.

# Notes For The Teacher

## Physical properties of water

1. Pure water is a clear, transparent liquid with no colour, odour or taste . The pleasant taste of drinking water is due to the dissolved air and CO2 and mineral matter. This explains why boiled or distilled water has a flat taste.
2. At 760mm of mercury pressure, pure water boils at 100°C. At higher pressure, e.g. in the pressure cooker, the boiling point is above 100°C; at lower pressures ,e.g. on a mountain peak, it is below 100°C (70°C at the top of Mt. Everest). So does food cook slower or faster at high altitudes than at sea level? Does food cook slower or faster in a pressure cooker?
3. One $cm^3$ of water at 4°C weighs 1.0g/ $cm^3$. At this temperature water has the maximum density.
4. Water expands on freezing, 92 ml changes to 100 ml of ice. Hence 100 ml of ice is lighter than 100 ml of liquid water. That is why ice floats on the surface of water. Sometimes ice on the top of a lake or other water body helps insulate the water below, sometimes preventing it from freezing all the way to the bottom.
5. Water is a remarkable solvent and dissolves many substances, forming aqueous solutions (water solutions) It dissolves almost every substance to some extent and is therefore described as the universal solvent. For this reason it is impossible to find absolutely pure water anywhere in nature (even in rain water).

# About the Script

This script has not yet been tried out. The authors are planning to add more sophisticated methods of water testing if they can procure a water testing kit.

# Can I do Yoga to Relieve Menstrual Cramps?

**Meenakshi, Anu, Aarti, Harleen, Karen**
**CEVA, Sector 11B**

For: Girls ages 12-18 (perhaps for a parent and daughter, or a small group of girls)

## Introduction

At least half of all girls and women experience cramps or discomfort associated with menstrual periods. The kind of discomfort varies from slight discomfort to dull aches to sharp pains in various parts of the body - or there may be some mental or emotional disturbance. We have tried various ways of reducing or preventing pain. Can yoga help?

## Science concepts

1. Observe, characterize, and compare menstrual discomfort
2. Experiment with knowing your own body in its wholeness.
3. Anatomy and physiology of your own body
4. Knowledge and practice of yoga
5. Human biochemistry of pain and action of hormones

## Previous knowledge

Basic knowledge and experience of menstruation

# Students' Guide

## Scenario: Minoo's Dilemma

Minoo's family was going on a trip to Kasauli in which they would have to do a lot of walking. Minoo was looking forward to the trip with great excitement. She had never before gotten a chance to go to Kasauli. However, just before the trip, she got her period. Whenever she got her period she had a lot of pain, and she would stay in bed for one or two days. But this time she really wanted to go on the trip.

She decided to go. Minoo was very busy helping get ready – preparing food to take along, etc. Two of Minoo's cousins also came along on the trip. They hadn't seen each other for a long time, and they were very excited to get a chance to talk. The walk was long and exhausting.

That evening, she suddenly realised that the whole day she had hardly had any pain, despite the fact that her period had started. She mentioned this to her cousin, Anu. Anu said that she used to get bad cramps and stay in bed, but then she started doing yoga regularly and now she hardly has any pain.

Could yoga really help reduce menstrual pain?

# Your Tasks:

1. Read and discuss the story and relate it to your own experiences. Do you also get menstrual pain? What do you do about it?
2. Make a list of each person's menstrual discomforts, indicating which parts of the body are affected.
3. Find someone to help you learn yoga, and try using yoga to alleviate menstrual pain.
4. Keep a diary of your menstrual cycle and symptoms and your yoga practice.
5. Analyse whether and how the yoga helped.
6. (Optional) Find out about reproductive physiology and the role of hormones in menstruation and in menstrual pain in order to understand how yoga can help.

# Teachers' or Parents' Guide

This script could be used by a mother and daughter(s), a mother and daughter and her friends, a teacher and a group of girls, or even a mixed group of adult women and girls who have just started menstruated. The adult(s) could take part on an equal ground with the young girls, also sharing their experiences and thoughts. One person with experience in yoga is also required.

## Suggested Teaching Strategy

1. With one or more girls, read or enact the scenario and discuss it.
2. Discuss who gets menstrual discomfort, what kind of discomfort, and which parts of the body are affected. Some possible questions for more discussion:
    a. What affects your discomfort – what makes it better or worse?
    b. Does having periods mean that women are inferior or less capable than men?
    c. Do women have to change their life style because of their periods?
3. Find someone to teach yoga and try using yoga to relieve menstrual discomfort.
4. Keep a diary of symptoms and yoga practice. A concerted effort over many months is best.
5. Analyse the affects of yoga on menstrual discomfort. It is best if a number of girls and women can compare their experiences.
6. (Optional) The following additional information can be used to understand more about reproductive physiology and why yoga works

# Additional Information for the Parent/Teacher:

## • The role of hormones in menstruation

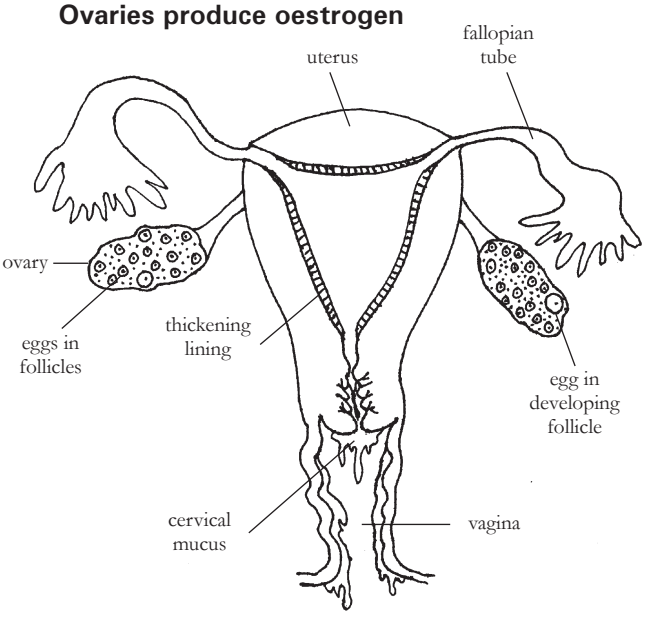
Hormones are chemicals produced by glands in our bodies which control certain functions like growth, whether we develop breasts or beards, etc. Hormones travel throughout our bloodstream and send signals and produce effects in many different parts of our body. Hormones also control whether and when we menstruate.

When we reach puberty, our bodies begin producing sex hormones. The hormones that are involved in menstruation are produced by the hypothalamus and pituitary glands in our brains, and by our ovaries (the two glands attached to our uterus).

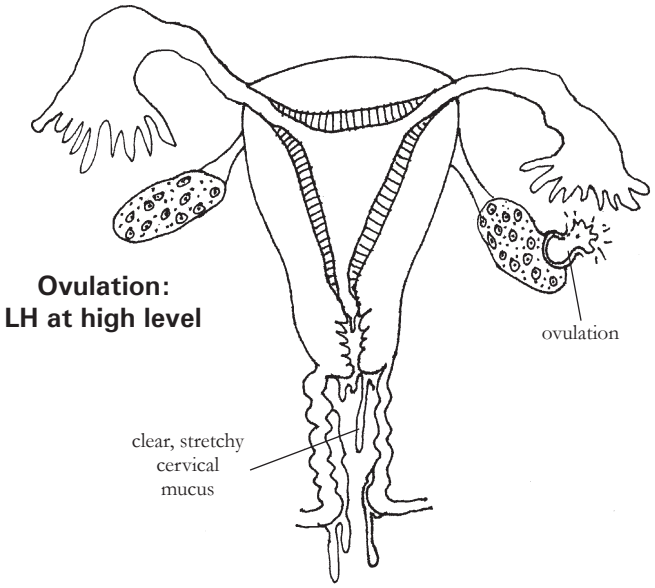
After our menstrual flow finishes, our ovaries start producing more of the hormone called oestrogen, which causes the uterine lining to thicken (which is useful if it receives a fertilized egg). Oestrogen also causes the mouth of the uterus (the cervix) to release a wet, slippery, clear mucus, which we might notice several days after menstruation stops.

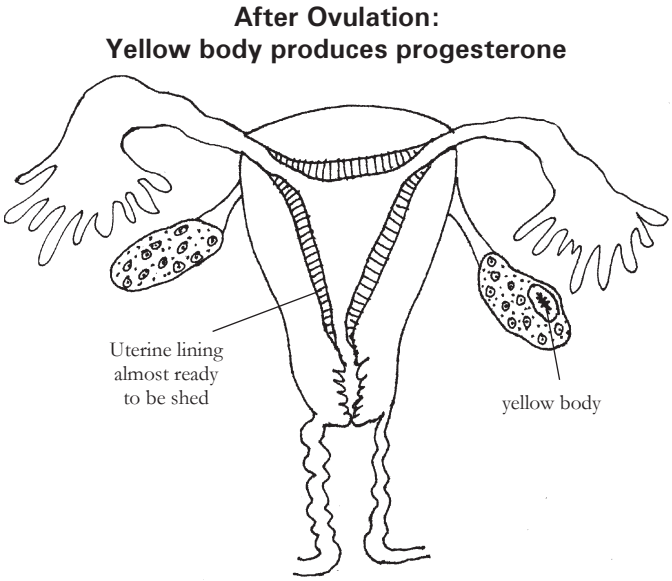
After an egg is released by a follicle in an ovary (the process of ovulation), the ruptured follicle produces another hormone, progesterone. Progesterone causes the uterine lining to secrete substances that nourish the developing embryo (this happens even if there is no embryo present). Progesterone may also cause the body to retain water – so we might feel a heaviness or less energy. It may also cause our breasts to enlarge slightly, which may be painful.

**Beginning of the Cycle:**
**Brain produces FSH,**
**Ovaries produce oestrogen**



In case fertilization has not occurred, the ruptured follicle turns into a 'yellow body', producing hormones for about 10-14 days before it withers away. The resulting decrease in the amount of progesterone and oestrogen causes the tiny blood vessels in the uterus to close off. The lining is then no longer nourished, and is secreted. This is the menstrual flow. It consists of blood, which may be fresh (bright red) or clotted (dark and lumpy), containing cells and particles of tissue from the lining, mucus, and vaginal secretions.




But when do the ovaries release an egg? This is controlled by hormones produced by the glands in our brain. When oestrogen is at a low level at the beginning of the menstrual cycle, the hypothalamus gland produces a hormone called GnRH. This reaches the pituitary gland (also in the brain) and signals it to produce the 'start-up' hormone called FSH. When FSH reaches the ovaries, it causes egg follicles to ripen. The developing follicles produce oestrogen. The increasing oestrogen causes the hypothalamus back in the brain to produce more GnRH, which signals the pituitary gland to produce more FSH and another hormone called LH. The large increase in LH and FSH causes an ovary to release an egg (ovulation). Then the levels of FSH and LH quickly decline, until the cycle starts again.

## • The role of hormones in pain and menstrual discomfort

During menstruation the muscles of the uterus rhythmically contract and expand and push the old lining out of the uterus. This may be painless or painful. (Painful menstruation is also called dysmenorrhoea.) The longer and harder the muscles squeeze, the more pain there is.

One reason it could be painful is if there is too much prostaglandin. Prostaglandin is a hormone-like substance that makes the muscles contract. Too much of it could cause excessive tightening of the uterine muscles, which might prevent adequate oxygen reaching the muscles. This causes lactic acid to build up in the muscles. The lack of oxygen and build up of lactic acid causes pain.

An excess of prostaglandin might even be found in the intestinal muscles, which might also cause pain. This could also explain why there might be a connection between menstruation and diet, digestion, intestinal gas, nausea, and constipation.

It isn't known why some people might produce an excess of prostaglandin. But if we can increase the amount of oxygen that gets to our muscles, we might be able to overcome the effects of prostaglandin and reduce the pain. Yoga may help us supply more oxygen to our muscles. It may also enable us to relax our uterine muscles. Both of these should help reduce pain. Also, exercise makes the body produce a natural pain-reducer called 'endorphin' – it balances the prostaglandin effects. (Endorphin is another hormone produced by the pituitary gland.)

There are also antiprostaglandin drugs, such as aspirin and ibuprofen, that some women find helpful in reducing menstrual pain. These drugs inhibit the synthesis of prostaglandin, thus reducing pain. However, they may produce side effects (upset stomach, allergic reactions, etc), and it isn't known how safe they are in the long term. Although it seems to be safe to take them occasionally, it is probably best to avoid prolonged use. Also, these drugs are not always effective.

If you can get relief from pain simply through yoga, wouldn't that be a better option? Besides, the effects of yoga may include other health benefits as well. It can help you feel lively, balanced, and happy.

## • What factors affect our menstrual cycles? Differences between people

While all our bodies obey the same laws of nature, each one has a special make-up and unique way of being. Each responds a little differently to various influences… like exercise or hard work, worry or emotional shock, fever and sickness, heat or cold, traveling, a different diet or less food… even extreme happiness!

Physical and emotional factors can affect the levels of hormones in our bodies. Hormonal imbalances can affect our menstrual cycles, mostly through modifying the timing of ovulation, or stopping ovulation altogether. This makes our menstrual cycles longer, or shorter. Physical and emotional stresses work through the mid-brain to stop the start-up hormone (FSH) so onset of ovulation gets prolonged.

For ovulation, our bodies need to have enough food – there should be enough fat in one's body to make hormones. Regular heavy exercise may delay ovulation, partly because fat gets used up. Women athletes or dancers sometimes have long cycles or even no cycles. If they eat more and gain weight, their periods can come back. Keep in mind that irregular periods are perfectly normal for some people.

There is a large variation in menstrual symptoms observed by women. Girls can make their own lists, which may include one or more of the following:

- More or less menstrual fluid (usually not more than 50-100 ml in one month)
- Different colours ranging from bright red to dark red to brown or almost black
- Duration of menstrual flow - usually ranging from 2 to 8 days
- Length of menstrual cycle - usually ranging from 18 to 36 days
- Mucus and various sticky or stretchy, clear, white, or yellowish secretions at different times in the cycle
- A dull ache in the middle or lower abdomen, back, or thighs
- Sharp pains in the middle or lower abdomen
- Pain or discomfort upon activity
- Pain or discomfort when resting
- A feeling of bloating in the lower abdomen
- Fatigue
- Extra energy
- A feeling of euphoria
- Insomnia
- Anxiety, tension
- Tendency to have arguments
- Increased gas
- Constipation
- Loose motions
- Nausea

Also note that some girls and women have no problems at all.

## • Yoga addresses connections between physical and mental well being

Through yoga, you realise the interrelations between your body and your mind, and you become more aware of your movement, breathing, flexibility, and tightness. You can gain control over acts and feelings that you were previously unaware of. Yoga can reduce stress, increase flexibility, reduce high blood pressure, relieve respiratory ailments, and improve hormonal functioning.

## • A note about why an experienced yoga teacher is necessary

Although just doing a certain aasan may have an immediate or eventual effect of alleviating discomfort, it is likely that a more complete understanding and practice of yoga will be necessary. Techniques for breathing, relaxation, movement, timing, and mental attitude are all important. It is very difficult to learn the essence of yoga from a book, which is why we suggest it should be learned from an experienced yoga practitioner.

## Notes for the yoga teacher

Practice should be systematic, starting with simple aasans, becoming stronger in these before proceeding to those that are more difficult. Practice is cumulative. When a new set of aasans is learned, it is practiced together with those learned previously. Attention to accuracy and perfection is important.

Here is a list of aasans that are thought to be of particular help in alleviating menstrual pain.

Baddha Konaasana (the "cobbler" pose. It strengthens the bladder and is invaluable for menstrual problems and in pregnancy.)

Savaasana I

Adho Mukha Svaanaasana

Salabhaasana

Jaanu Sirsaasana

Triang Mukhaikapaada Pascimottaanaasana

Pascimottaanaasana

Upavista Konaasana

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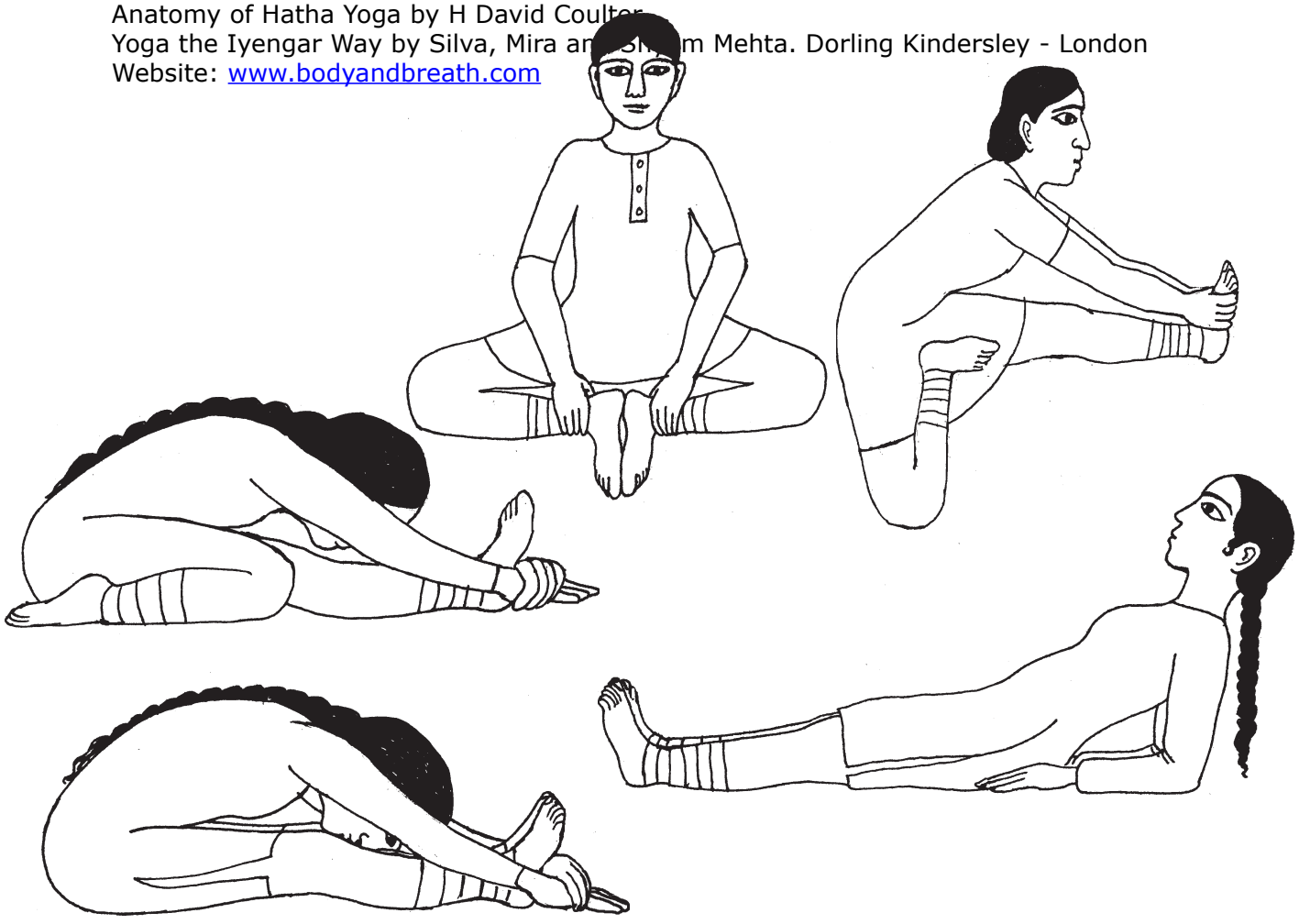


## About This Script

This script has not been tried out yet.

# Does Zarda Affect Your Work Performance?

**Aarti Sharma and Jagdish Chand**
**Youth Technical Training Society, Sector 11B**

Grade Level: 9 yrs to 12 yrs

## Introduction

Some people chew zarda (chewing tobacco), using it as a stimulant to provide extra energy so that they can work hard. We have found that most adults are aware of the harmful effects of zarda consumption upon the body. However, we discovered that children, including young zarda consumers, were not fully aware of the ill effects of zarda. If these children learn more about the consumption of zarda and the effects of all forms of tobacco on their bodies, maybe then they will be less likely to use it.

## Science Concepts

1. Physical imbalances in the human body
2. Health of people working in a zarda factory
3. Zarda causes oral cancer
4. Zarda causes anaemia due to loss of appetite
5. The cause of stimulation in the body

## Previous Knowledge

The students must already have some previous knowledge of zarda (chewing tobacco) consumption.

## Teaching/learning materials

1. A human body chart.
2. Posters displaying ill effects of zarda, why and how tobacco is consumed.
3. Pamphlets giving information on zarda and other forms of tobacco.
4. Zarda packet.

# Students' Guide

## Scenario

During the lunch break all the children went out to play and had their food. Lunch break was over and the children came back to their class. Sir came to the class and asked the children to take out their books and copies. When Yogesh opened his bag he realized that his pencil was missing. Yogesh cried out, "Sir, my pencil is not in my bag. How will I do my work? Sir..rr". Just to appease Yogesh, Sir gave him the permission to check everybody's bag to look for his pencil. As Yogesh was searching Anil's bag he came across a packet of zarda. News of the zarda packet in Anil's bag spread like wildfire making Yogesh forget about his lost pencil.

Sir called Anil and very politely questioned him, "Anil, beta is it yours?"

Anil stammered, "Uh.. uh..Sir who..uh…u Sir what..uh.uh..h. No.o.o Sir. "

# Your Tasks

1. Read the scenario.
2. In small groups discuss the use of zarda and personal accounts of zarda usage by people you know.
3. Conduct a survey of people who consume zarda.
4. Conduct a survey of people who sell zarda.
5. Think of questions about zarda and it's effects on health, and get answers from a doctor or an activist who will visit you.
6. Make posters, pamphlets or an audio piece on tape recorder informing the harmful effects of zarda.
7. Calculate how much is the monthly expenditure on zarda or any other form of tobacco.

# Teachers' Guide

## Suggested Teaching Strategy

1. The session can begin with a group discussion where participants talk about zarda consumption.
2. The teacher should write down the views of all the participants on the board to make it visible.
3. Ask the children to decide how to conduct a survey of zarda consumers and also get the students to write down the questions they will ask. Most likely students will ask the following questions:
    - What is zarda?
    - How is it made?
    - Where is it sold?
    - Since when have you been consuming it?
    - Do people of all ages consume it?
    - Have you had any medical problem due to zarda?
    - Are you addicted to zarda?
4. A survey of zarda sellers could also be conducted. For this, ask the students to write the questions they want to ask. Most probable questions will be:
    - Do you eat zarda?
    - From where do you get it?
    - What are the ingredients of zarda?
    - What is the procedure of making?
    - What is the cost price and selling price of zarda?
    - Do sell it to everyone regardless of his/her age, sex etc.
5. Have an activist or a doctor come and talk to the children answering their questions and informing them about the harmful effects of zarda.
6. The doctor or activist will also inform the children about the de-addiction and counselling centres in and around the town.
7. Ask the children to prepare posters or an audio piece and hold an exhibition of all the work children have done during the project. This will empower each child and make them realize that they can function better if they co-operate with each other and work in groups.

## Notes for the Teacher

1. Children should have some previous knowledge about zarda consumption.
2. The teacher has to be careful that during the project participants don't start consuming zarda themselves.
3. The teacher must be very careful that the participants don't take tobacco selling as a profitable business, an easy way of earning handsome money.

## About the Script

The teacher, I and children worked as a team to come up with the script. It was developed by an evening slum school with different ages of children. To work more effectively, we worked in groups of different ages.

We would start off with an interesting brain storming session regarding consumption of tobacco, particularly zarda (chewing tobacco). Children were actively involved in the script and immediately after a session they would split in smaller groups and go for the survey.

These children came to realize the harmful-effects of zarda and the amount of money being spent on buying tobacco. We also realized that selling zarda is a profitable business - sellers make a profit of 47% on each packet they sell.

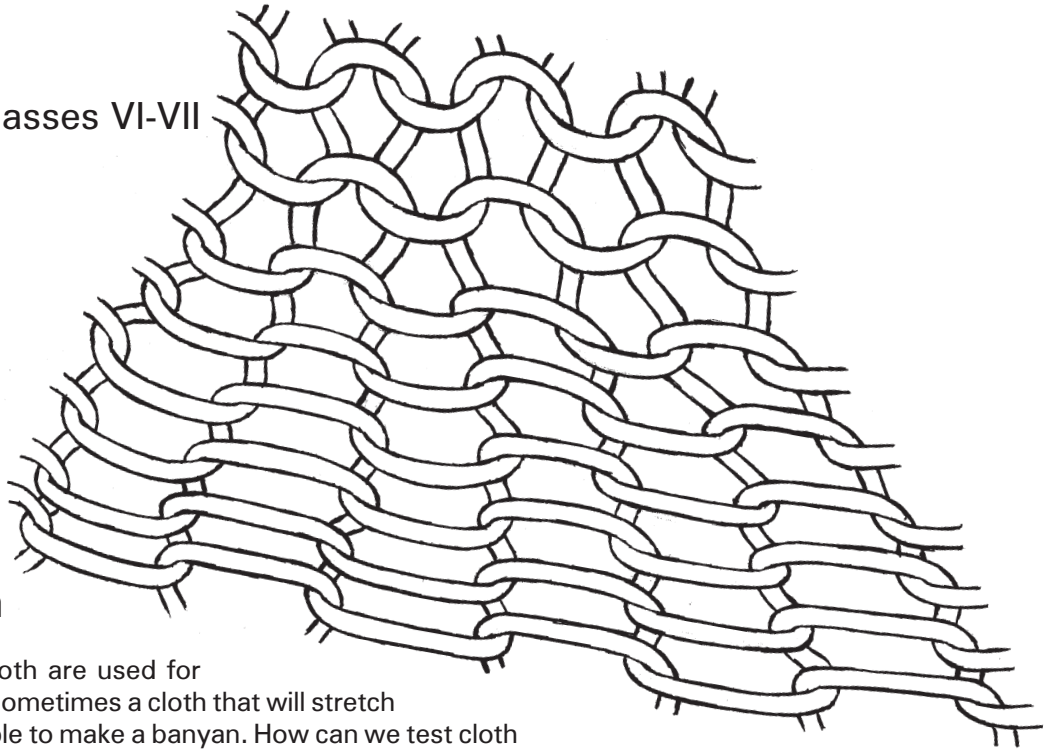
Maybe this script will prevent some children and young adults who were involved in this project from acquiring the habit of zarda consumption.

Editors' Note: One issue that has not been addressed is the role of the manufacturers, advertisers, and government in the promotion of zarda usage. Maybe these are the real culprits that must be forced to change their habits - their habits of taking advantage of the people in order to fulfil their own greedy desires.

# What Kind of Cloth Stretches a Lot?

**Karen Haydock**
**TII/45 Sector 25**

Grade level: Classes VI-VII



## Introduction

Different kinds of cloth are used for different purposes. Sometimes a cloth that will stretch is needed, for example to make a banyan. How can we test cloth to find out how much it will stretch?

## Science concepts

1. Comparing characteristics of cloth: stretchiness
2. Observation and comparison of different types and weaves of cloth
3. Designing a fair test for cloth stretchiness

## Previous knowledge

The students should have some previous knowledge of:

1. Measurement of distance in cm and mm

## Teaching/learning materials

Samples of a number of different types of woven and knitted fabrics

Scales, scissors, hand lens, string, rubber bands, cardboard, paper, graph paper, pins, paper clips, stapler, glue, and other general supplies

# Students' Guide

## Scenario: The Three Sisters

Once upon a time there were three sisters, Fabrikina, Fabrikona, and Fabrikita. Fabrikina, the oldest sister, was a woman of the world. Fabrikona, the middle sister, was with it. But poor Fabrikita, the youngest sister was just plain Fabrikita.

One cold, rainy winter's day, when Fabrikita was only 11 years old, a grave misfortune struck their family. The father and mother of the three sisters were both killed in a bus accident. The sisters didn't know what to do because they had no other relatives that they knew of. Finally they decided they would have to go to work in the cloth mill. They went to the owner of the cloth mill to ask if they could work there. It was the end of the day and everyone was just leaving the mill. But they found the owner on his way out, just as he was about to lock the door. He said he did not need any more workers, and he wanted to go home and have a cup of tea. But they pleaded and told him that they would not survive if they could not find some work. So finally he agreed, but only on the condition that they could solve one problem. The problem was that they had to design a new cloth and make enough of it to make 1000 banyans. Furthermore, they had to do this by the next morning. The owner locked the three sisters up in the mill and went home.

The sisters were scared. They had no idea what to do. How could they design and make cloth? Besides, it was cold and dark in there (there was only one small light hanging from the enormous ceiling), and the three sisters had nothing to eat. They just sat down and thought. Fabrikina was so cold that her teeth were shattering. She looked around and noticed a small brass lamp in the corner. She went and picked it up, thinking maybe they could light it. It was rather tarnished, so she rubbed it to get it clean.

Then, to the amazement of the three sisters, a jinn came out of the lamp in a puff of smoke!

"At your service! You are three sisters and you have three wishes! Your wishes are my commands!" the jinn announced.

The three sisters were overcome with joy.

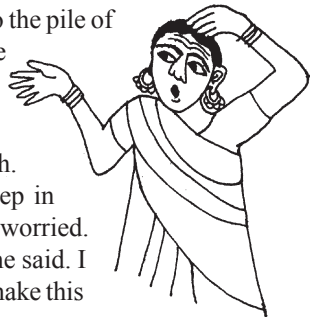
Fabrikina knew exactly what to wish for. "I wish for a design for a new cloth that will be good for making banyans!" she exclaimed.

No sooner had she finished than the jinn disappeared back into the brass lamp. only to return a few seconds later with a detailed design for the new cloth.

"Ah, but now it is my turn," said Fabrikona. "I wish that we had enough of this new cloth to make 1000 banyans!"

Again, the jinn disappeared into the brass lamp, and again he returned in a few seconds, this time pulling metre after metre of the new cloth out of the lamp.

The two eldest sisters ran to the pile of cloth, exclaiming with glee on it's beauty.



But now it was the turn of Fabrikita to make a wish. She was standing back deep in thought. She looked a little worried. "this doesn't seem right, she said. I wish we could design and make this cloth ourselves!"

The next thing the sisters knew, the jinn was gone, the lamp was gone, and the cloth was gone as well!

The two eldest sisters glared at Fabrikita. "What have you done!" they exclaimed. "We had such good fortune – but now you have spoiled everything!"

"Don't worry," said Fabrikita. "We must have gotten my wish – now we will be able to design and make the cloth!"

And indeed, that was what happened. All three sisters went to work. First they discussed what kind of cloth would be good for a banyan. They all agreed that, most important it should be a stretchy cloth. Then they designed a number of different kinds of cloth. They made small samples of each one. Then they tested each sample to see how stretchy it was. They found the stretchiest one and set to work making it. Just as the sky began to get light in the east, they finished making enough of it to make 1000 banyans.

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# Your Tasks:

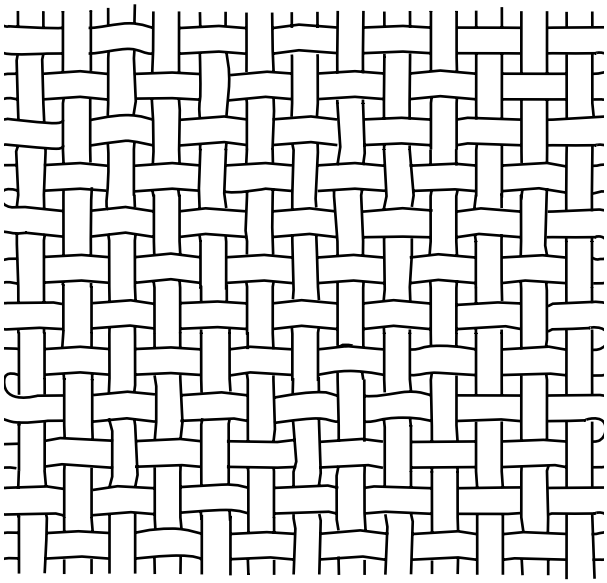
1. Read the story out loud with expression and action.
2. Work in groups to:
    a. Devise a fair way to test different types of cloth to find out how stretchy they are.
    b. Take 5-10 different samples of cloth and test them for stretchiness. Record your results.

Each group will then present their conclusions to the rest of the class.

The class will discuss and compare the results and the methods used.

# Extension Handout : Identify Types of Weave

## Woven and Knitted Fabric



Two main types of fabric are woven and knitted fabric.

**Fig 1:** In woven fabric, separate yarns are lined up lengthwise (the warp or baanao), through which the weft yarn (tanao) is horizontally woven by inserting it over and under the warp yarns.

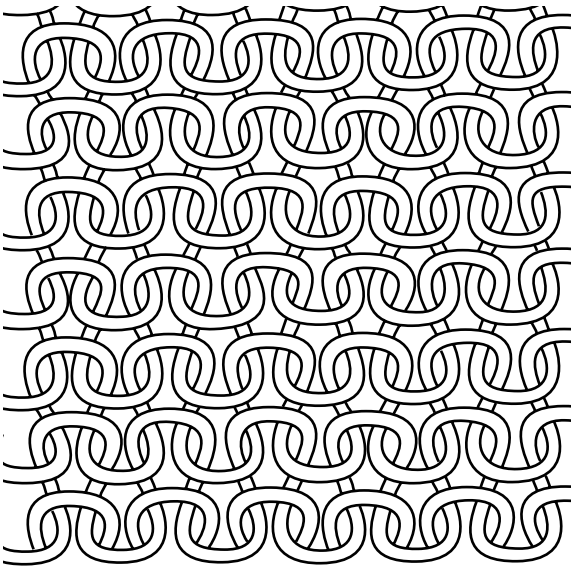


**Fig 2:** In knitted fabric, one continuous yarn is intertwined in a series of connected loops left from each previous row.

By examining the above pictures, you can imagine which type of fabric might stretch more.

## Different types of weaving.

The following pictures show more types of weaving. Using a hand lens if necessary, examine cloth samples and see if you can find examples of these different kinds of weaving.

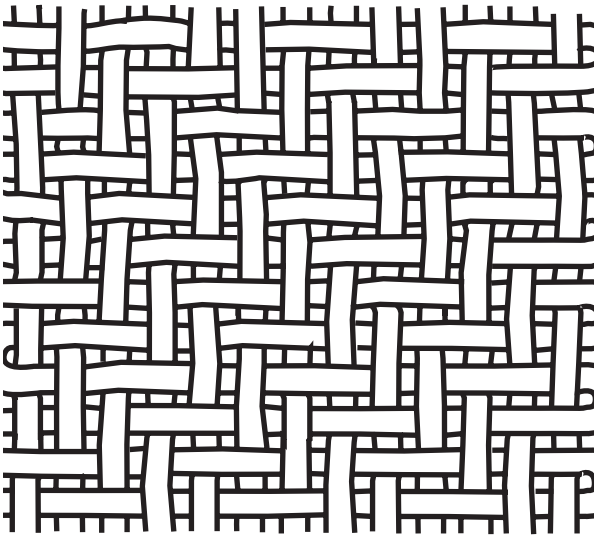


**Fig 3:** Twill weave.

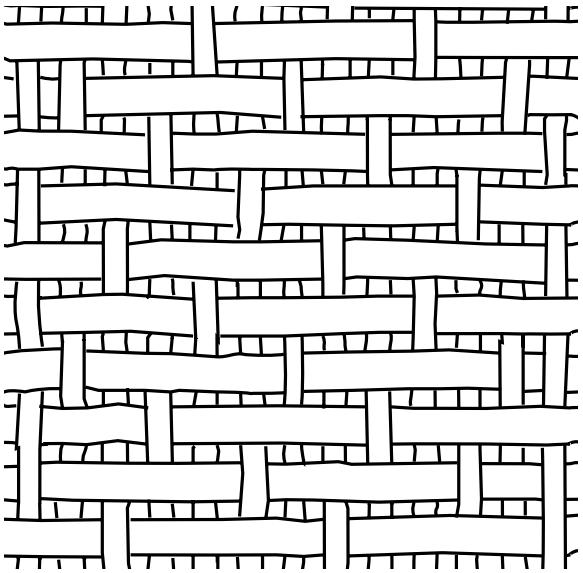


**Fig 4:** Satin weave.

Colour the yarns differently in the above pictures to get interesting patterns.

# Teachers' Guide

## Suggested Teaching Strategy

1. Ask the students to read the story out loud, with expression and action.
2. Divide the class into small groups (4-6 students). Each group should devise a fair test for cloth stetchiness, use the their method to test 5-10 samples of cloth, and record their results.
3. Each group should present their results and conclusions to the rest of the class and a class discussion can follow.

It might be best to give each group the same kinds of cloth, to see it different groups get different results. Reasons for the differences could then be discussed. This might lead to further questions and further tests.

## The following kinds of questions might be discussed:

a. How did each group's methods differ?

b. What problems did you have in testing the cloth?

c. What methods for testing were tried but not used because they didn't seem to work?

d. Was each test really fair? Why or why not?

e. Did every group get the same results? Try to explain any differences.

f. Did anyone find that the same piece of cloth stretched different amounts in different directions? If so can you think of a reason for this?

g. What questions arose as you worked?

h. Can you think of other ways cloth can be tested and other methods to use?

## Possible extensions:

1. Ask the students to make bar graphs to show their results.
2. Try more kinds of cloth.
3. Observe each cloth closely (maybe using a hand lens) and classify each cloth according to how they are woven or knitted.
4. Give the students diagrams of different types of weaves and knits and ask them to identify each of their types of cloth samples (see Extension Handout).
5. Analyse why different weaves and knits are more or less stretchy, and why they are more stretchy in some directions.

# About the Script:

This script was tried out by the adult participants of the First Chandigarh STL Workshop.

First the Scenario, was enacted. Then we went around the circle of participants counting off the numbers from 1 to 6 in order to randomly divide everyone into 6 groups of about 5 each. Each group was asked to:

- Devise a fair way to test different types of cloth to find out how stretchy they are.
- Take 5-10 different samples of cloth, test them for stretchiness, and record their results.

The teachers were not given any other explanations or guidance, except that we told them that there was a table with supplies that they could use if they wanted. The supplies included scales, scissors, glue, string, thread, needles, clips, and other stationery items.

After about 30-45 minutes everyone was called together to present their findings.

Group 1 said that they had tested the cloth samples by stretching them horizontally and diagonally, noticing that they stretched more diagonally. They had some difficulties measuring with the scale and holding the cloth from all sides to keep it even, so then they removed one thread from each sample and tested how much it stretched. They found that threads from the more stretchy materials got curly when they were removed, while those from less stretchy materials remained straight. One sample had two different types of thread (for the warp and weft) – one was stretchy (because it was wavy) and the other wasn't. They also wet the samples to see if that made a difference. They said they could plot a graph based on their measurements, although they didn't have time to do so. An additional question that they thought of in the course of their experimentation was: since the stretchablity of the cloth and the threads was different, how can they compare and resolve the question?

Group 2 began by labelling the cloth A, B, C, and D. While writing they realised that writing on each material was different – and writing on a stretchable material was the most difficult. They then cut the length of each material to 5 cm and then measured how much it increased when it was stretched. They found that the green and cream coloured cloths were the most stretchable. Finally, they removed yarn from each cloth and tested its stretchability. They also classified the cloth, and found that cotton was non-stretchable and synthetic was stretchable. They mad a graph of the results.

Group 3 numbered each piece of cloth, and used scales to measure how much they stretched. They identified three ways to stretch the cloth: along the warp or along the weft (baanao or tanao), or diagonally. They found that the cloth stretches the most diagonally. They also reported that since they used manual tests the results are bound to differ each time.

Group 4 used scales to measure the stretchability of threads taken from each cloth. Their results were similar to those of Group 2.

Group 5 didn't feel the need to go into too much detail in the testing. They measured the stretchabilty lengthwise (along the warp?). They observed that stretchability depends on the type of weave: loose knit cloths stretched the most, while tightly knit ones stretched the least. Also the stretching is the most along the diagonal. They realised that this can explain why clothes can get distorted if they are hung in the wrong direction to dry. They also reported that the elasticity of the thread determines the stretchability. An additional question that occurred to them was: if a cloth is made of two types of thread, one stretchable, the other not, will the material stretch? It will probably depend on the weave.

After the group presentations, we all discussed the activity and the script, including also the Teachers' Guide.

Some people said that they could easily continue to have a good time for the next 2 days investigating these pieces of cloth. Also, the activities are useful because people do need to solve such problems and do tests before they produce cloth.

Others said that the results of the problem are not as important as the process we were going through to solve the problem. It may take students some time to realise that they are not expected to get 'the unique, correct answer,' and that the process is important.

All participants took part in the activity, each contributing a special quality. People liked the idea of having materials available without being told exactly what to do with them.

The group work made the participants realise that there are many different ways of doing things. Most teachers said it would be possible to do such group work in their classes, but certain problems were also pointed out.

# Is it Necessary to Behave Badly When There is a Lot to Do?

**Harleen Kohli & Meenakshi Sud**
**CEVA, Sector 11B**

Grade Level: VIII, IX, X & beyond

## Introduction:

Our health is directly related with our behavior and how we handle stress in our lives. One way to manage oneself in a mentally taxing and stressful situation is to use deep and rhythmic breathing.

Children tend to, unconsciously follow the behavior pattern of the adults around them.

Take a look at what happens in the family home when there more work load than usual for adults. A typical situation is when the house is untidy, the adults are over-worked and the family is expecting 'important' guests. A highly irritable adult shouts out orders to whoever will listen, the other adults shout back. Verbal abuse or rough language and accusations are exchanged – "You always….", "I never…."s bound off the walls. Very often children are the ones to get the brunt of it all.

If this kind of a scene happens often enough in a family, when the children are later put in a potentially stressful situation they will handle it in a similar way. This kind of a thing can continue over generations.

The sympathetic nervous system is activated when the mind perceives physical or mental stress. Whenever you experience stress there are three phases to your response:

A stressful event,
Your inner appraisal of it,
Your body's reactions.

You may not always be able to control the stressful event or your body's reactions. But the appraisal, phase 2, is the vital link that bridges the event and the reaction, and this is up to you.

## Science Concepts:

1. Observing the effect of stress on the body
2. Observing your breathing
3. Observing the connection between your mind and body
4. Respiration and your body
5. Knowledge of human biochemistry and action of hormones

## Teaching Learning materials:

A model of the human body preferably showing the different parts separately or at least a model in a book.

# Students'/Child Learners' Guide:

## Scenario:

Today is Sunday and Papa is home. The children are used to their father shouting irritably as he goes around the house "putting it in order". The week has been very busy, what with both the adults doing regular 9 to 5 jobs and the evenings taken up with preparing a meal for the family, tuitions, getting home-works done and handling visiting relatives and guests.

"Would you mind getting up and helping me?"…..."OH ho what have you done. Who asked you to butt in and upset everything!" " Don't just stand there, stupid can't you see that. PICK IT UP RIGHT NOW. Everyone in this house is blind".

"If I don't get all this done, we'd be forever living in a dirty house."

Ratika finds herself doing a similar thing at her school when the classroom has to be decorated for a class party or some group work is being done. The rest of the children bear with it for a while. Then a fight starts and they refuse to have her with them and tell her to go out of the room while they were doing it up. She is hurt. Her closest friend tells her that she really had been very bossy and obnoxious. A thing that could have been a lot of fun was turned into a horrible chore. When she tried to put the blame on her classmates her friend helped her see how the fault lay in Ratika's behavior.

After similar situations had happened several times, Ratika had become branded as a quarrelsome child. She lost many friends, and she became depressed. The next time her favorite aunt visited them and asked Ratika about her school, she burst into tears and told her all about it.

# Your Tasks:

1. In small groups brainstorm about the different stressful situations and difficult moments in your family and how did the family deal with it and themselves.
2. Prepare a questionnaire and record sheet with the help of your teacher.
3. Observe the family for a few days and talk to them individually about their typical behavioral patterns in times of stress. Ask them to observe themselves and tell you. Give them the questionnaire to fill out.
4. Fill out the record sheet on the basis of your observations and the questionnaire.
5. Share your observations and the result of your survey in class with others and compare notes.
6. With the help of your teacher, make a list of the common behavior patterns, typical situations and the common coping strategies.
7. Discuss with your teacher about the bio-chemical reactions in the body when it prepares itself to deal with stress and anxiety. Find from the library and on the Internet what actually happens.
8. Discuss the result of a habitual tendency to become anxious and tense.
9. Discuss what is meant by 'coping strategies'.
10. Find out how deep breathing helps the body and mind to cope.
11. With the help of someone who has knowledge of yogic deep and rhythmic breathing and relaxation techniques, do exercises that help you to get in touch with your body and also teach you how to keep your faculties together when coping with stress..

Adapt the above suitably for a situation in which a parent is working with her/his own child (and possibly the child's friends).

# Teachers' Guide:

## Suggested Teaching strategy

1. After discussing about the scenario and allowing the students to talk about it in the larger group, then divide the students into groups and ask them to brainstorm about the difficult situations and times in the family and how the family members handled them. Discuss about the meaning of coping strategies. *If you are working with your child, then talk together about it.*
2. In the whole class/group lead a discussion on how can we observe and record typical behavioral patterns of family members and friends.
3. Together prepare a questionnaire and record sheet.
4. Discuss with the children how they would go and talk with their family members. Talk about possible reactions; help them talk about the different ways the family communicates with each other. Add a touch of light heartedness to put the students at ease. Maybe they could do role-play exercises to predict reactions or dramatise typical behaviors. *If you are working with your own child/ren then you could take the help of the other members of the family and initiate discussion.*
5. After the children have brought back the filled in questionnaire, again lead a discussion in class about the their experiences while doing this task.
6. Help the children complete their record sheet. They can work in groups.
7. Make a list of the typical situations, common behavior patterns, and the common coping strategies.
8. The teacher would need to direct the attention of the students to the connection between the mind and body. Give them a few examples and let them themselves come up with examples of how this connection works.
9. Lead a discussion on the bio-chemical reactions in the body when it prepares itself to deal with stress and anxiety. Find from the library and on the Internet what actually happens. Direct their attention to the consequences of a habitual tendency to become anxious and tense.
10. Help the children to get in touch with their breath, by directing their attention to their breathing process. Use the suggested exercises for this purpose.
11. With the help of a model of the human body, discuss with them about how respiration takes place in the body.
12. Conduct the suggested exercises and guided meditation with the students. It is suggested that the students be slowly introduced to the meditation exercises, increasing the time gradually and conducting the exercise in stages.

## Notes for the Teacher:

Every change in the mental state is reflected in the breath and then in the body. Gross indications such as posture as well as distinct bodily sensations are directly related to one's style of breathing. Changes of feeling are registered immediately in ones pattern of breathing.

Anger produces shallow inhalation and strong, panting exhalation. Fear creates rapid shallow ragged breathing. Sorrow creates spasmodic, broken breathing.

On the other hand, positive emotions such as joy produce more balanced breathing as the chest cavity relaxes.

This phenomenon also works in reverse, changing the breath pattern also causes altered emotions. Paying attention to breath is a vehicle for releasing stress and allowing the body to find its own balance.

Paying attention to oneself and one's breath gives one a chance to observe ones behavior in an objective manner and overcome the moment's anxiety, relax and give a signal to the body to relax.

## Moodometer:

It helps the children to deal with their stress if they can be helped to externalize their feelings and moods. Since children find it difficult to talk about or even understand what is happening to them, I suggest the following activity.

Stretch a cord across the room or against a wall space in the classroom. This is a number line. Do some activity to help the children see it as a number line. Then give each child a clip or clothespin (with her/his name written on it) to mark her mood on the number line on a scale of 1 – 10. The very action of deciding whether one is happy or sad helps one to think of one's feelings and many times 'feel better'.

Please Note: It would help if the teacher tried out the exercises and relaxation techniques herself before doing them with the children

## Breathing exercises: To help the children observe their breath.

Ask the children to run up and down the stairs a few times. When they come back ask them to sit cross-legged on the floor. Ask them to put one hand on their chest and the other on their stomach. They should then breathe deeply and feel their lungs and stomach expanding and contracting.

Ask them to put their hands on a friend's back and feel the chest cavity expand and contract with the inhalation and exhalation of the breath.

Lead a discussion in class about what happens to our breath when we are angry, sad, weeping, ecstatic, filled with wonder.

Ask them to watch themselves in the next few days to see how their breath changes with their feelings.

## Guided Meditation:

The conductor will be talking to the students in a monologue through out the exercise.

Instructions for the Instructor:

1. Throughout the exercise keep the tone of your voice even and neutral so that it is not sharp or authoritative, but is gentle and pleasant. Speak clearly as possible. See that you are audible to all.
2. Do not move around while talking. It is distracting for the listeners to have your voice coming from many different directions.

3. The room should be fairly dark, and total silence is to be maintained.
4. Ask the students to loosen their clothes and belts and remove their socks and shoes..
5. Ask them to lie comfortably on their backs with their feet at least one foot apart and their arms at an angle of 45 degrees away from their bodies.
6. Let them lie silently for about 2 – 3 minutes with their attention tuned to the sounds around them.

## Text of the meditation process:

> Ensure that no part of your bodies comes in contact with any other person…take your attention to your feet…relax all your toes, one by one…heels…soles of the feet… the ankles…calves…knees…thighs. Relax your whole leg take three deep breaths and feel the breath in your toes.
>
> Now relax your hips, lower back, mid back, shoulder blades lying on the floor, your stomach and your chest.
>
> Watch your chest rise and fall and take three deep breaths watching the breath in your chest.
>
> Relax your shoulders; upper arms elbows, forearms, wrists, the back of your hands, fingers and fingertips.
>
> Now move your attention to the back of your neck. Relax it. Now relax the back of your head resting on the floor, your scalp, temples, forehead, eye brows, eyelids, cheeks, nostrils, mouth, chin, throat, ears.
>
> Take your attention to your navel and watch it rise and fall with your breath. When you breathe in the navel rises and when you breathe out the navel falls.
>
> Take your attention a little higher to your ribs and watch the circular expansion and contraction of your ribs.
>
> Now move your attention to your chest. Watch the sternum rise and fall with your breath. Now take your attention to your nostrils. Watch the two streams of breath, one going in and one coming out. The one going in is cool and the one coming out is warm.

Note: The students can be asked to practice focusing on their breath during various times in the day. They can be asked to practice the relaxation technique also, so that they can use it in times of need. Suggest to them to try the relaxation technique when they are about to sleep.

# About the script:

The script has been tried out in workshop situations, within the family and with a group of very few children.

For trying out in a class full of children you would need to have a good rapport with the students. You would also need a space different than a traditional classroom. The school hall can be used for this purpose.

We would suggest that the ideas and activities be introduced step by step. For example in the beginning a two minute silence for a few days can lead to a a five minute session of concentration on the environmental sounds.

After this a short exercise of watching ones breathing.

The full guided meditation can be done when the children are familiar with the idea of this kind of activity taking place in their traditional learning space at school.

# Mouldy Rajma

**Karen Haydock**
**TII/45 Sector 25**

Grade level: Classes V-VII

## Introduction

In our everyday lives, questions arise that require logical, scientific thinking. Getting practice sorting things into sets and knowing how to use Venn diagrams can help in solving such problems.

## Science concepts

1. Sorting things into sets
2. Use of Venn diagrams

## Previous knowledge

The students should have some previous knowledge of Venn diagrams.

## Students' Guide

### Scenario

Premlata and Hargovind were sorting rajma. They found that although they looked all right from the outside, when they split the rajma in half, some of them were mouldy. Some of the rajma were bigger than the others. And some rajma were browner than the others.

Premlata found that all the mouldy brown rajma were big.

She also found that all the mouldy big rajma were brown.

Premlata's question is:

Does it therefore follow that all the big, brown rajma were mouldy?

## Your Tasks:

**A** Form groups and discuss the following:

1. Is it important to answer Premlata's question? Why or why not?
2. Answer Premlata's question in any way that you can.
3. Use Venn diagrams to show the answer.
4. Think of as many more ways as you can to answer Premlata's question. Is there more than one correct answer?

**B** Present what each group finds to the others and have a class discussion.

# Teachers' Guide

## Suggested Teaching Strategy

1. Read the story out loud to the class.
2. Divide the class into small groups (4-6 students). Each group should discuss and write down the answers to each question.
3. Each group should present their results and conclusions to the rest of the class and a class discussion can follow.

# About the Script

This script has not been tried out. It is included here in order to see if there is any interest in trying short scripts that require more mathematics than science. Also, it is meant to stimulate a discussion as to whether a (socially relevant) problem could be phrased in terms of a logic puzzle. Or has a puzzle just been moulded into a (perhaps unlikely) scenario?

# Sounds - Their Effects

**Geeta Vadhera and Surabhi Singh**
**St. Johns High School, Sector 26**

Grade Level: Classes 3, 4 and 5

## Introduction

This script looks at the various sounds around us. The activities aim at raising awareness to the formation of sounds, transmission and reception of sound and how it is produced. It also investigates the differences between pleasant and unpleasant sounds. The major goal is to raise awareness of sound pollution.

## Scientific Concepts

1. There is sound all around us.
2. Sound plays an important role in our behaviour and human life.
3. Vibrations produce sounds, which are transmitted in the form of sound waves.
4. Different things produce different sounds.
5. Sounds are both pleasing and unpleasing.
6. Noise pollution is a result of a collection of sounds of various loudness which adversely effect the human system.

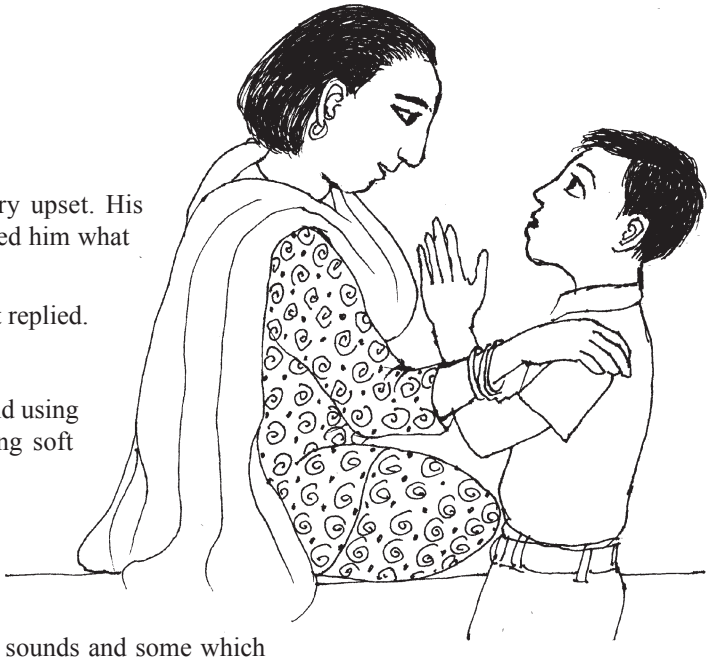
## Previous Knowledge

Students are familiar with different kinds of sounds, but may not be experienced at classifying them according to loudness, pitch, and how pleasant they are. They will probably be able to tell which of two sounds is louder if the difference is enough, but they may not know what is meant by pitch. They may even be confused between the loudness and the speed of notes in a song. They have probably heard of and been irritated by noise pollution, but they may not have thought much about it.

## Teaching / Learning Material

Musical instruments (harmonium, guitar, tabla, flute etc) empty containers, plastic containers, plastic sheets, rubber bands, funnel, hosepipe, set of test-tubes, comb, paper, baking tin, dried beans sticking tape, plastic bottle with ridges and panpipes.( for making musical instruments.)

# Students' Guide



## Scenario

Aneet came home back from school looking very upset. His mother seeing his sad face took him aside and asked him what the matter was.

"My teacher was very upset with me today", Aneet replied.

"Why?", asked his mother.

"I answered in class without putting up my hand and using a loud voice. In fact Raman was praised for being soft spoken and polite."

"His voice must have been pleasing," said mother.

"Does the sound of the voice matter?" asked Aneet.

"Yes, there are many things which make pleasing sounds and some which make unpleasing sounds," answered mother.

"I don't think it matters as I get better marks than him," retorted Aneet.

"You said your teacher was unhappy with you as you spoke in a loud voice," said mother. "Sounds make a difference." She added. "From now on let's start observing different types of sounds and learn about pleasing and unpleasing sounds and let's see how noise pollution is made."

# Your Tasks

1. Read or enact the scenario and discuss it.
2. Observe the sounds around you at various times of the day, and notice the difference in the volume.
3. Try to differentiate between the types of sounds you hear:
   a) At home
   b) At school
   c) In the school bus
   d) At the playground
   e) While watching the TV
   f) On a visit to the market
   g) In the temple
   h) In a birthday/ wedding/zoo
   i) In a music room
4. Your teacher will play some sounds. Sort the sounds you hear into two sets: pleasing and unpleasing. Afterwards, share and discuss the results.
5. Take a rubber band, fix it at one end, stretch it out, and pluck it with your finger. Listen to the sound produced by it. Stretch the rubber band out further and observe the change in the sound and also observe how the rubber band vibrates.
6. You can't see sound but you can see its effect. Put some rice in a home made drum and play a radio or bang on a tin lid nearby, but without touching the drum. Does the sound make the rice bounce?
7. Noise Pollution: Discuss with the children how very loud noise damages our ears. Diwali noise, noise pollution on the roads, at home, in the school etc. The children will also discuss how we can protect ourselves from noise pollution.

## Student Handout 1

(Each student gets a few copies to be filled up in different places.)

Go to different places and listen to the sounds you hear.

Write down your observations for each place:

Name of Place:_____

I hear sounds made by:

_____

_____

_____

_____

The loudest sounds are made by: _____

The least loud sounds are made by: _____

The least pleasant sound is made by: _____

The most pleasant sound is made by: _____

On average the sound level is (tick one):

| completely quiet | very quiet | not too loud | loud | very loud | so loud my ears hurt |
|---|---|---|---|---|---|

## STUDENT HANDOUT 2

List all the pleasing and unpleasing sounds you have heard.

| PLEASING SOUNDS | UNPLEASING SOUNDS |
|---|---|
| | |

# Teachers' Guide

## Suggested Teaching Strategy

1. Read or enact the scenario and discuss it.
2. Ask the students to observe the sounds around them at various times of the day, and notice the difference in the volume.
3. Ask the students to try to differentiate between the types of sounds they hear:
    a. At home
    b. At school
    c. In the school bus
    d. At the playground
    e. While watching the TV
    f. On a visit to the market
    g. In the temple
    h. In a birthday/ wedding/zoo
    i. In a music room
4. Tape various types of sounds on a cassette. Ask the children to listen and tabulate the sounds into pleasing and unpleasing. Afterwards discuss what is the meaning of a pleasing sound, and how different children have different opinions, and how the same sound can be pleasing at one time and unpleasing at another time.
5. Ask the students to take a rubber band, fix it at one end, stretch it out, and pluck it with a finger. Listen to the sound produced by it. Then tell them to stretch the rubber band further and hear the change in the sound and also observe how they can see the rubber band vibrating. Ask the students to tell you when the pitch sounds higher and how they can make a louder sound. In case some students don't know the difference between pitch and loudness, you might first test them by asking them to tell which of two notes you sing or play on a musical instrument is louder and which is higher in pitch (see below).
6. To demonstrate that you can't see sound but you can see its effect, you can do the following. Put some rice on a homemade drum. Set the drum on the floor, and play a radio or bang on a tin lid nearby. The sound will make the rice bounce even though you are not hitting the drum. (The sound waves travelling through the air are making the rice vibrate.)
7. Noise Pollution: Discuss with the children how very loud noise damages our ears. Diwali noise, noise pollution on the roads, at home, in the school etc. The children will also discuss how we can protect ourselves from noise pollution.

## Further Extensions

You can also try various other experiments and activities with the children in the class:

## Making musical instruments

Music is the arrangement of sounds of different types (sounds of different loudness, pitch or swar, quality or tone, and rhythm). When we sing we modulate our voice to produce these notes. In musical instruments we use vibrating objects like string, reeds, stretched skin, columns of air in tubes and hollow containers, etc. Children can listen to different instruments and can make their own instruments:

1. Bottle organ: bottles filled with different levels of water
2. Harmonica: using a comb and paper
3. Guitar: A box or baking tin and elastic bands
4. Shaker: A covered plastic glass containing beans
5. Trombone: a plastic hose pipe and a bucket of water
6. Scraper: a plastic bottle with ridges
7. Pan pipes of different lengths

# Additional Information for Teachers

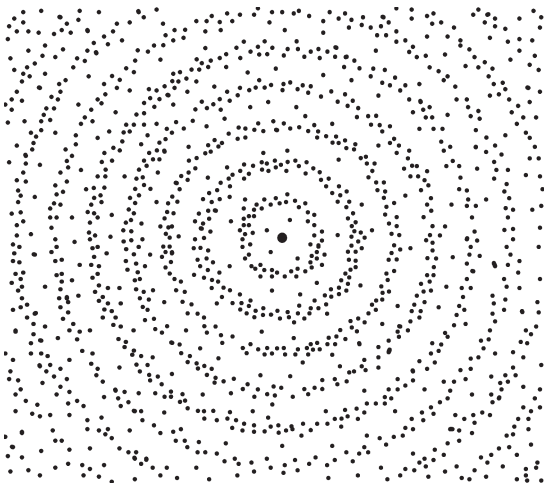
Sounds are vibrations. We cannot see these vibrations, but we can see the way some sounds make things vibrate. For example, if you place some grains of rice on a drum that is very close to the speaker of a loud radio, you can see the grains of rice vibrating.

We can also make some things vibrate, feel and/or see how they vibrate, and hear the 'sound vibrations' (or 'sound waves') they produce. For example, when we pluck a string or hit an object like a tabla, we make the string or tabla vibrate (move up and down in a regular pattern). Although we can't see it, the vibrating string or tabla also makes the air around it vibrate. It is something like what happens if you hit the surface of a bowl of water: waves start going out across the surface of water starting from where you hit it. When you hit a tabla, waves get made in the air surrounding the tabla. These waves go out in the air in all directions, not just the two dimensions you see in the water waves.

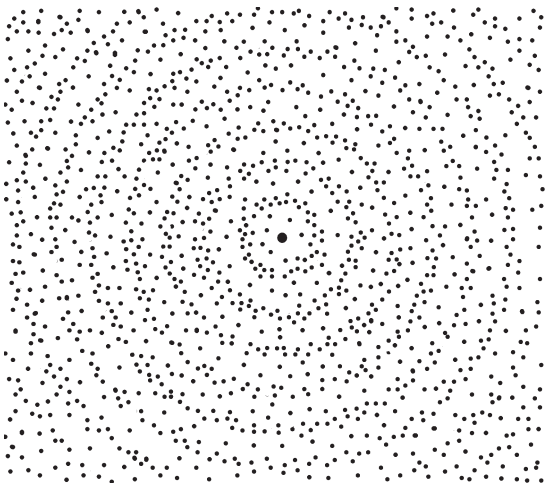
Just as each particle of water does not move much as waves move out across the surface (you can see this by watching an object floating on the water), each air particle does not move much as sound waves travel through air. But whereas in water the particles move mostly up and down to create the troughs and crests of waves, in air the particles move mostly back and forth in line with the direction the sound wave is moving. The sound waves consist of regions of compressed and rarefied air (see Figs(a) and (b)).

## The different kinds of sound we hear are due to different types of sound waves.

The following pictures show what air particles might look like



(a) for a very loud sound, and



(b) for a not so loud sound

(Of course we can't really see the air particles, but these are models to show what the air particles would look like if we could take a snapshot of them. Try to imagine that they are 3-dimensional, not like these 2-dimensional pictures.)

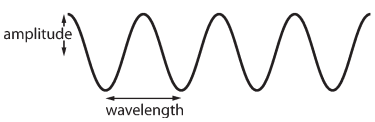
The above pictures of sound waves correspond to water waves of larger or smaller **amplitude** (amplitude means height). We can also use pictures like the ones shown below as models for sound waves. Here are pictures of the two different kinds of sound waves shown above: (Remember, bigger waves mean bigger (louder) sound, smaller waves mean smaller (softer) sound.)

(c) louder sound

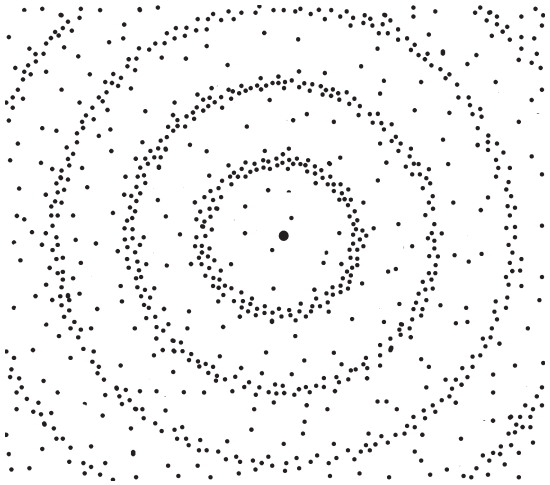

(d) less loud sound

If the distance between each wave is larger, we will hear a lower **pitch** sound (a sound of lower **swar**):

(e) a lower pitch sound than (a)




(f) the same sound as in (e)



The length between the crests of two adjacent waves is called the wavelength. If the distance between each wave is smaller, we will hear a higher sound (a sound of higher pitch, or higher frequency). The sound in (a) is of a higher pitch than the sound in (e).

Since the speed of all sound waves in air is the same, the number of waves that hit our eardrum in one second will be fewer if the wavelength is longer. So we say that sounds of longer wavelength have a lower **frequency**. Sounds of shorter wavelength have a higher frequency. The sound waves in (c) and (f) have the same loudness, but (f) is of a lower pitch than (c).

Different sounds also have differently shaped sound waves. For example, when a note of the same loudness and the same pitch (e.g. Sa) is played on a flute and a sitar, the two notes will sound different. They have different qualities, which enable you to recognize which instrument they come from. This is because the sound waves they produce have different shapes. If you have a computer with a microphone, you can get software for it that will enable you to see pictures of the sounds you make into the microphone. (The computer will calculate the relative loudness and pitch of the sounds and draw a picture of a wave with this relative amplitude and frequency.) For example:

A note from a tuning fork

The same note from a violin

The same note from an oboe
(which is similar to a shehnai)

**Note:** the above discussion is for teachers' own edification, **not** to be passed on to the students. Students in Class VI or less will not be able to comprehend the physics of sounds at this level.

Young students can get experience listening to different sounds. They can start trying to differentiate between sounds that are loud and sounds that are not so loud, and between sounds of high pitch and sounds of low pitch. You might sing or play two notes on a musical instrument and ask the students to tell which one is of a lower pitch, or which one is louder, or what is the difference between the two. They can practice making different sounds with different objects and instrument and classifying them in different ways. For example, see if each student can tell the difference between a loud note at a low pitch and a not so loud note at a high pitch. After students have a lot of such experience with sound, they will be in a position to learn more about the physics of familiar sounds when they are in upper classes (and when they have also learned more mathematics).

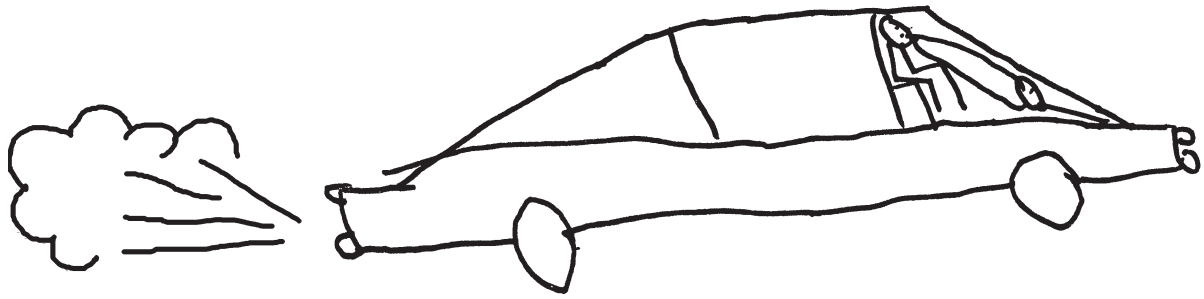
## About This Script

Since this script is designed for a younger age group, it should be less theoretical and should involve more of interactive work with the students. Many interesting experiments were tried out with the children in Classes 3, 4, and 5. Some instruments were made in class and the formation of different types of sound was demonstrated. Also differences between pleasant and unpleasant sounds were investigated by playing a cassette of different sounds. This was a good experiment in class as the children actively participated in it. The effects of sound pollution and how it is caused were also discussed in class.

# How Clean is the Air we Breathe?

**Gagan D. Bhangu**
**Sri Guru Harikrishan Model School, Sec 40**

Grade level: Classes IV-V



## Introduction

Air pollution is a serious concern as with the increasing number of industries and the decreasing number of trees the different types of pollutants are increasing. The polluting particles, often very small, can effect the environment nearby and far away (blown great distances by the wind). The pollutants settle on the ground and on buildings, and sometimes we inhale them into our lungs. Students will compare the air pollution in different places around their homes.

## Science concepts

1. Pollution
2. The effects of deforestation
3. The effect of pollution on our health
4. Use of the hand lens

## Previous knowledge

1. Types of pollution

## Teaching / Learning materials

Strips of paper, masking tape, petroleum jelly (such as Vaseline), string, hand lens

# Students' Guide

## Scenario

Aman is talking with his friend Deepa: "You know my household duties have increased since we moved to this area."

"How?" asked Deepa.

"I now have to dust my room including all my books twice a day!"

"I think it could be due to the fact that your house has a road running in front of it as well as in back. The more vehicles go, the more is the dust that comes in. Also, there are fewer trees than where you used to live," Deepa reasoned.

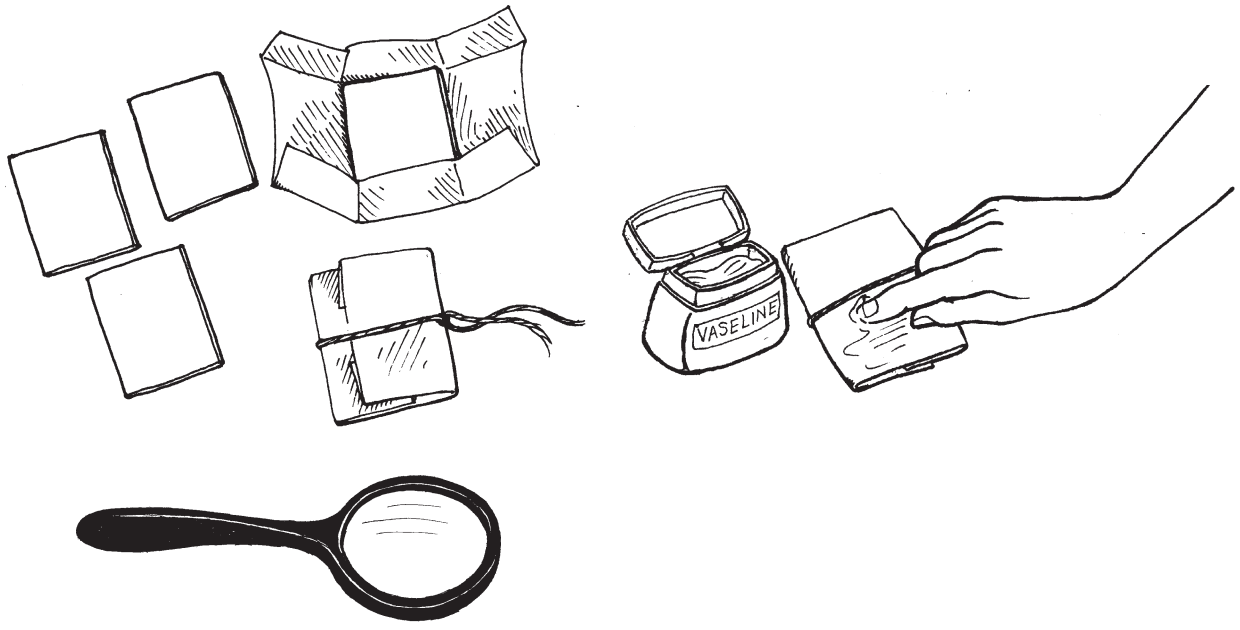
"I wish we could do something about this. Let's go and ask our teacher if there is anything we can do about it."

Teacher: "I'm glad you have awareness of this serious problem and want to try doing something about it. Why don't you first find out how much pollution there is in different places in your area?"

# Your Tasks:

1. Find out how much pollution there is in different places in and around your home. This can be done by collecting particles from the air on sticky cards.
    a. Smear petroleum jelly on 4-5 cards (use stiff white cardsheet or cardboard about 5 x 10 cm in size). Use string to tie each card to a different location outside as well as inside your house.
    b. Check the cards every 3-4 days to see how much particulate matter (dust, sand, soot, odd bits and pieces of material, pollen, and other small particles that float in air) have collected on them.
2. Compare what kinds of particles have collected in different places. (Use a hand lens to try to identify them).
3. Compare the amount of particulate matter collected in different locations and by students living in different parts of the city. What conclusions can you make?

# Student Handout



Name: _____ Date: _____

Describe the area where your house is located. Are there many trees? How many and what kinds of roads or paths are there?

_____

_____

_____

_____

_____

_____

Use the following Table to record your observations of the cards you place for detecting pollution.

| Card No. | Date and Season | Location of Card | Presence of Trees | Observation |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

# Teaching Guide

## Suggested Teaching Strategy

1. Read or enact the scenario with the children.
2. Ask the children about the different types air pollution and the effects of air pollution on humans to find out how much they already understand.
3. Ask the children to collect particulate matter by making and placing the sticky cards in different places. Give them the handouts on which they should record their results. Ask them to bring their cards after a certain number of days, so that they can use hand lenses to see what they have collected.
4. Give the students time to examine their cards with hand lenses, compare each others cards, and record their results and conclusions. (Help them learn how to use the hand lenses.)

# About the Script:

I tried this script at home with my 10 year old niece. She smeared cards with petroleum jelly and attached them to different places around our house.

I suggested places to her so we could see how dirty they became at different places. The places were chosen in accordance with how dirty I thought the place normally was. For example, I have noticed that things in the central part of the house get less dust on them than things in the room at the front. The first card was placed outside the house near the road, the second was in the backyard near a lemon tree, the third was at the front of the house (where two roads intersect), the fourth was in a sitting room in the centre of the house, and the fifth was inside in a cupboard.

My niece was pretty impatient, and even I expected to see results in a couple of days. But it was a full week before the cards inside the house showed results that could be compared.

A hand lens was used to observe the cards. It was explained that a hand lens makes things look bigger. Some tiny particles which were not visible to the naked eye were seen with the hand lens.

On the fifth day, we found the following: Card 1 was black to some extent because of smoke from vehicles. Card 3 was the dirtiest, since dust from the roadside (where two roads intersected) was stuck to the card. Card 4 had negligible dust. Card 5 was absolutely clean. Surprisingly, Card 2, which I had expected to be dirtier than Card 3, was not so dirty. Perhaps the reason was that the lemon tree on who's branch it was tied, had prevented accumulation of dust to some extent. This led to suggestions on how to improve the situation by planting more trees.

Maybe this experiment could have been more interesting if it was done with a group of children, since then there would be a variety of results and more interesting discussions.

The amount of matter collected on the cards indicates the amount of pollution that is in the air and that we are probably taking into our lungs as well.

Perhaps we should distinguish between particulate matter that is waste material produced by human activities (factories, vehicles, fires, etc) and particulate matter that consists of sand, pollen, etc. Only the former is usually referred to as pollution. But deforestation, heavy traffic, and many other human activities can also cause an increase in sand and dust in the air. On the other hand, pollen would be higher in areas with more plants. Which kinds of particulate matter are harmful to people?

# Can Deep Breathing Help Me Relieve Physical Fatigue?

**Anuradha Bhasin and Meenakshi Sud**
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Grade Level: Class III Upwards


## Introduction

Modern life is full of external stressors that cannot be avoided. A city is a stress machine, cranking out noise and air pollution along with excessive speed and overcrowding. Each person is involved in a number of activities as his goals are high and competition is tough. Achievement does give one self-confidence but also leaves us tensed and fatigued. With this speed of life it is very important for us to learn ways of relaxing so that we can live our lives more effectively. Deep breathing is one such method that can help us relax anywhere and anytime.

## Science Concepts

1.The respiratory system

2.Effect of physical stress on the body

3.Effect of deep breathing and relaxation on the body

## Prior Knowledge

How to measure your own rate of breathing

How to measure your pulse

Some knowledge of how the respiratory system consists of all the organs of the body that contribute to breathing (the nose, mouth, upper throat, larynx, trachea and bronchi, which are all air passages, and the lungs, where oxygen is passed into the blood and carbon dioxide is given off).

## Teaching Material

1. A quiet and comfortable room
2. If possible, rugs
3. A clock or watch with a second hand

# Students' Guide

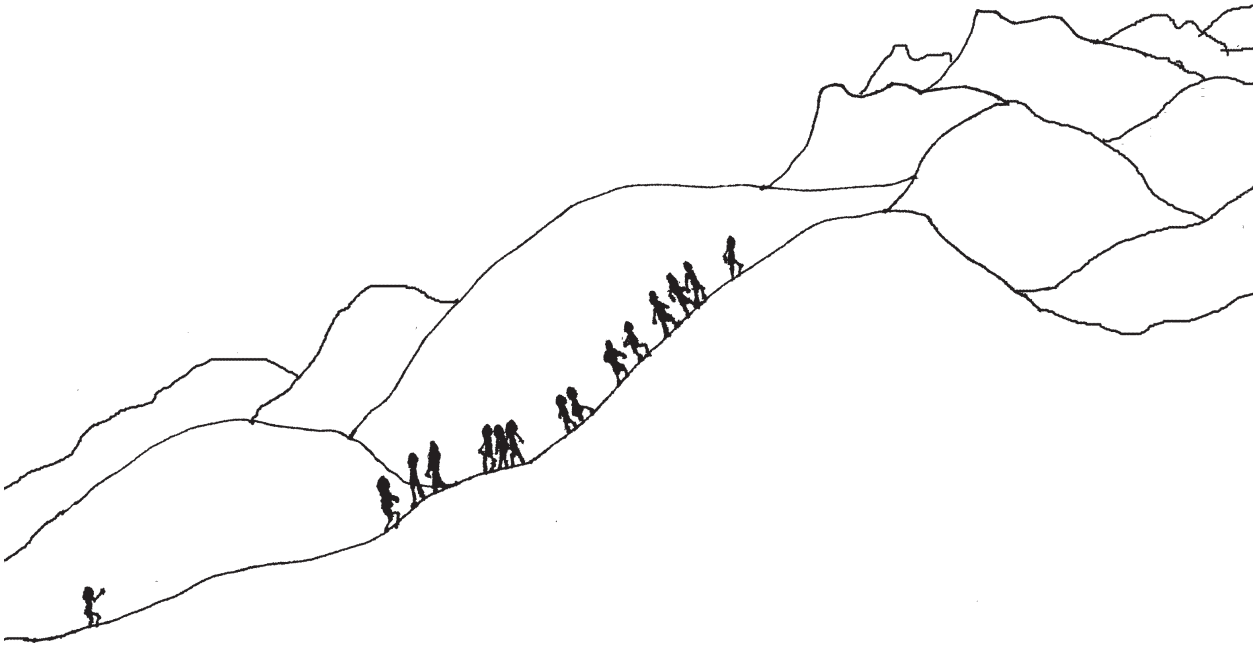
## Scenario

During her summer vacations Khushi decided to go on a trek with the NCC to Kedarnath. Cadets from allover the country were a part of this trek. The initial part of reaching the base camp and learning the basics was real fun. But when the actual trekking started it was also a lot of hard work. The Kumaon hills were beautiful and everyone had this urge to reach the top fast. All the cadets were moving at a slow pace, as it was an upward climb. But Khushi was finding it difficult to keep pace with everyone else. Initially her friend moved at her speed to give her company but then she too moved ahead. Seeing Khushi pant for breadth the instructor decided to walk with Khushi. She told him that she wanted to dropout and stay back. This was not possible as there was no way to take her back and the instructor didn't want her to give up. So he taught her a little exercise. Every time she took her breadth in she said 'Pick, Pick' and every time she breathed out she said 'Drop, Drop'. This process made her conscious of her breath and she started taking deep breaths and the climb became easier. Soon Khushi started enjoying the beauty around her, the snow-clad peaks, open pastures, little waterfalls finding their way between rocks and the cool breeze touching her body. She was so overwhelmed by this natural beauty that she sat and wrote a lovely poem. And soon she reached Kedarnath.

She will always be thankful to her instructor for not letting her give up and teaching her this exercise which she now uses whenever she is tired.

# Your Tasks

1. Complete the activities on Student Handout 1 in order to find out how doing yoga after doing a strenuous activity might affect your physical and mental feelings. Discuss the results.
2. Complete the activities on Student Handout 2 in order to find out how breathing deeply while doing strenuous activities might affect your physical and mental feelings. Discuss the results.
3. Act out the scenario.
4. Discuss in small groups, and make a list of situations where you get physically tired. Discuss what you do when you are very tired. Do you have effective methods to prevent you from getting too tired? Share your experiences with everyone.
5. Think of new questions concerning physical fatigue. Can you find out ways to answer your questions?



## Student Handout 1

1. Run around quickly for 5 minutes. Immediately measure your breathing rate and pulse and fill in Table 1. Then sit down and read a book before testing again at 2, 5, and 10 minutes.

**Table 1: Running without doing Yoga**

| Time | Feelings | Breaths/minute | Pulse (beats/minute) |
|---|---|---|---|
| immediately after running | | | |
| 2 minutes after running | | | |
| 5 minutes after running | | | |
| 10 minutes after running | | | |

2. Once again run around quickly for 5 minutes. Immediately measure your breathing rate and pulse and fill in the first row of Table 2. Then, one minute after you stopped running, do the yoga exercises that your teacher asks you to do, pausing in between to test at 2, 5, and 10 minutes.

**Table 2: Doing Yoga after Running**

| Time | Feelings | Breaths/minute | Pulse (beats/minute) |
|---|---|---|---|
| immediately after running | | | |
| 2 minutes after running | | | |
| 5 minutes after running | | | |
| 10 minutes after running | | | |

3. Compare your results in Tables 1 and 2. Did doing yoga after running change your feelings, your breathing, or your pulse?

## Student Handout 2

1. Fill in Table 1 immediately after doing each of the given physical activities.

**Table 1: Doing Activities without Deep Breathing**

| Activity | Feelings | Breaths/minute | Pulse (beats/minute) |
|---|---|---|---|
| Running | | | |
| Climbing stairs | | | |
| Dancing | | | |

2. Now repeat each of the activities, but this time pay attention to your breathing as you are doing the activity and breathe deeply. Fill in Table 2 immediately after doing each activity.

**Table 2: Doing Activities with Deep Breathing**

| Activity | Feelings | Breaths/minute | Pulse (beats/minute) |
|---|---|---|---|
| Running | | | |
| Climbing stairs | | | |
| Dancing | | | |

3. Does trying to breathe deeply change the way you feel as you are doing the activities?

4. Does deep breathing while doing the activities affect your breathing or pulse?

# Teachers' Guide

## Suggested Teaching Strategy

The students can practice the following breathing and relaxation exercises to get used to paying attention to their breathing. When they are fully comfortable they can continue with the activities in the Student Guide and Student Handouts.

## Instructions for Breathing Exercise

To be able to use deep breathing to relax it is important to first pay attention to your breath. The teacher needs to get the children used to getting in touch with their breathing. For this they need to do a few simple exercises.

a. The teacher asks the children to sit in a relaxed position, close their eyes and listen to all the sounds they can hear in the surroundings. Gradually she asks them to cut themselves off from all other sounds and concentrate only on the sound of their breath, letting the breathing be absolutely normal.

b. Let the child sit in a simple posture with legs folded. The back must be held straight. There must be no tension in the body in order to keep it upright. There should be no tension in the chest, abdomen and shoulders. The chin must be placed parallel to the floor in order to keep the neck relaxed.

c. Place one hand on the chest and the other on the stomach. Exhale fully and then start breathing in S-L-O-W-L-Y. The hand on the stomach begins to move outwards and then the one on the chest moves upwards with the expansion of the chest. Finally fill up to the throat. Now slowly breathe out and feel the hands fall back gently.

d. Place palms on your back at your lower ribs, fingers pointing towards each other. Breathe in and feel your hands expand upwards and outwards while you breathe in, noting the involvement of the lower back and the rib cage while breathing in.

## The Relaxation Exercise

- The room should be fairly dark, and total silence is to be maintained.
- Ask the students to loosen their clothes and belts and remove their shoes and socks.
- Ask them to lie comfortably on their backs with their feet at least one foot apart and their arms at an angle of 45 degrees away from their bodies.
- Throughout the exercise keep the tone of your voice even and neutral so that it is not sharp or authoritative, but is gentle and pleasant. Speak clearly as possible. See that you are audible to all.
- Do not move around while talking. It is distracting for the listeners to have your voice coming from many directions.

## What the teacher says:

Ensure that no part of your body comes in contact with any other person….take your attention to your feet…. Relax all your toes, one by one….heels….soles of the feet….the ankles….calves….knees…. thighs. Relax your whole leg, take three deep breaths and feel the breath in your toes.

Now relax your hips, lower back, mid back, shoulder blades lying on the floor, your stomach and your chest.

Watch your chest rise and fall and take three breaths watching the breath in your chest.

Relax your shoulders, upper arms, elbows, forearms, wrists, and the back of your hands, fingers and fingertips.

Now move your attention to the back of your neck. Relax it. Now relax the back of your head resting on the floor, your scalp, temples, forehead, eye brows, eyelids, cheeks, nostrils, mouth chin, throat, ears.

Take your attention to your navel and watch it rise and fall with your breath. When you breathe in the navel rises and when you breathe out the navel falls.

Take your attention a little higher to your ribs and watch the circular expansion and contraction of your ribs.

Now take your attention to your chest. Watch the sternum rise and fall with your breath.

Now take your attention to your nostrils. Watch the two streams of breath, one going in and one coming out. The one going in is cool and the one coming out is warm.

**Note :** Suggest to the students that they can try the relaxation exercises anytime they are tensed or tired.

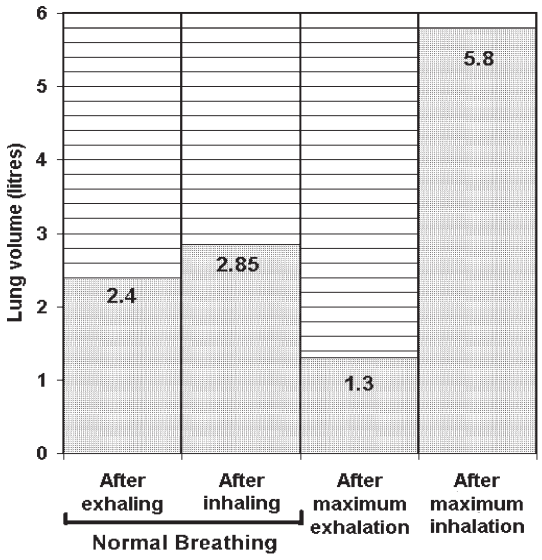
1. Before reading or discussing the scenario, the students should complete the activities on the Student Handouts (this will make it more likely that they will not pay attention to their breathing in the beginning). For the first activity, ask the students to run around as fast as they can for 5 minutes. Then use a clock to tell them when to record their feelings, rate of breathing, and pulse. Then ask them to run around for another 5 minutes. This time, ask the students to do yoga exercises beginning one minute after they stop running. See below for an explanation of how to lead the yoga exercises. Have a class discussion on the results.
2. For the second activity, ask the students to spend 3 minutes doing each of the strenuous activities, as given in Student Handout 2. Immediately after each activity they should record their feelings, rate of breathing, and pulse. Then ask them to ask them to repeat each of the same activities, but this time, pay attention to their breathing and try to breathe deeply while doing the activity. They should again record their feelings, rate of breathing, and pulse immediately after each activity.
3. After discussing their results, they can enact the scenario, and carry out the discussion on physical fatigue.

## Additional Information for the Teacher

At rest, each person breathes at a particular rate.

With a slight increase of activity the speed of breathing increases. As the physical stress increases, the rate of breathing increases further and the breathing becomes shallower. As the individual is not able to take in the required amount of oxygen, he or she starts panting. This reduced intake of oxygen affects the entire body functioning.

In a normal breath, an individual takes in about 500cc of air and in a deep breath the same person may take in four to six times more air, i.e. about 2000-3000cc. As a deep breath is able to take in so much more oxygen, the body doesn't need to exert itself and so is able to relax.



## About The Script

The script was tried with a small group of 5 students and one teacher. The students were already accustomed to doing yoga so it was easy for them to do the breathing exercises.

The classroom is at the third floor of a building and the teacher who went through the exercises has now made a habit of breathing deeply as she climbs the stairs. She finds it much easier to climb stairs now. The children too do not get tired climbing the stairs when they put their attention to their breathing and breathe deeply while climbing the stairs.

# Degrading Waste

**Gagan D. Bhangu and Gitanjali**
**Sri Guru Harikrishan Model School, Sec 40**

Grade level: Classes V-VIII

## Introduction

'Biodegradable' is a word much thrown around these days. What is it? When organic matter (fruit, bread, vegetables, even dead plants and animals) is left on or in the soil, it starts to "break down". This natural (and constant) biodegrading process caused by micro-organisms releases nutrients into the soil. Instead of burning these wastes, they can be turned into compost that is useful for gardening.

## Science concepts

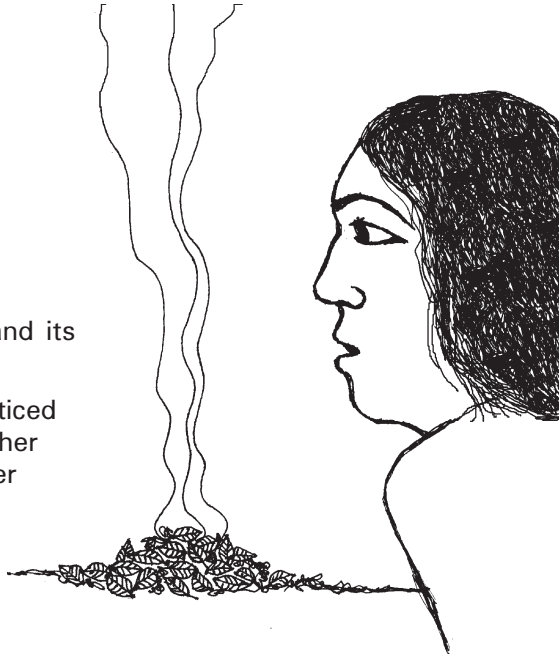
1. The biodegradation process
2. Classification of materials on the basis of whether or not they are biodegradable

## Previous knowledge

1. Some knowledge about what things are made of (e.g. plastic, glass, metal, paper, wood, plants, animals, living or non-living, etc).
2. It isn't necessary that the children have a detailed understanding of biodegradation and the role of micro-organisms in biodegradation.

## Teaching/learning materials

A peel or skin of fruit (banana), a slice of bread, onion skin, a plastic or thermocole cup, a piece of aluminium foil, waste paper, dried and green leaves, a small shovel, cardboard and pen with waterproof ink



# Students' Guide

## Scenario

Chandigarh is known as "the City Beautiful", but increasingly it and its adjoining towns are facing a serious problem of air pollution.

Billu has asthma and smoke irritates her condition. One day she noticed that a pile of leaves was being burnt outside her house. She asked her mother whether there wasn't any better way of disposing of leaves. Her mother explained that in her opinion it was better to put the leaves in a compost heap so that they would decompose and turn into compost, which could be used as a fertilizer in gardening.

Billu wanted to know whether plastic and other wastes also decomposed.

So Billu and her mother did an experiment to find out.

# Your Tasks:

1. Figure out how you can do an experiment to find out which kinds of waste decompose and which don't. Write down your plans.
2. Write down what you think the results of your experiment will be.
3. After discussing your plans with an adult, try out your experiment. Be sure to write down what you do, and what the results are.
4. Discuss and write down the conclusions you reach. If the results raise more questions in your mind, can you figure out ways to answer those questions?

# Student Handout

**Name:** _____ **Date:** _____

**Date of waste burial:** _____

| No. | Name of item buried | Time since item was buried | Observations |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
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# Teaching Guide

## Suggested Teaching Strategy

1. Read or enact the scenario with your children. Discuss it.
2. Ask the children what are some different types of waste materials. Name some waste items and what they are made out of.
3. Ask the children to plan an experiment to find out which types of waste materials decompose more or less readily. You might suggest that they could try out different conditions as well as a wide variety of different items.
4. Discuss the plans, asking questions about unclear or neglected aspects, or possible problems with the proposed experimental procedure.
5. Let the children do the experiment, providing assistance only if necessary.
6. Discuss the results and conclusions and encourage the children to do more experiments.

## If you prefer, you could suggest the children can do the experiment as follows:

a. Find a place in your house or your friend's house where you can dig small holes for this experiment.

b. Dig 8 sets of 2 holes (16 holes in all), each about 15-20 cm deep.

c. Place the following things in the holes:

| Hole | Item |
|---|---|
| 1 and 2 | banana skin |
| 3 and 4 | onion skin |
| 5 and 6 | slice of bread |
| 7 and 8 | plastic or thermacole cup |
| 9 and 10 | waste paper |
| 11 and 12 | dried leaves |
| 13 and 14 | green leaves |
| 15 and 16 | aluminium foil |

d. Place a labelled marker stick over each hole to show what is buried there.

e. Cover all the holes with soil. Water the odd numbered holes each day, and let the others remain dry. (This may be difficult at some times of the year – where can it be done?)

f. After every few days, dig up what you buried. Note down your observations in each case. Cover with soil and continue the experiment as long as the items keep changing.

## Possible Extensions

1. Talk about how composting might be organised so that only degradable things are used – biodegradable and non-biodegradable garbage has to be segregated.
2. Set up a permanent compost pit in your yard.
3. Talk about degradation: what it is, and how it works in everyday life.
4. Discuss whether non-degradable garbage can be reduced in your own household. Try out some ways to do this. For example, can you reuse plastic bags or use other shopping bags instead? Can you buy fewer drinks in plastic bottles and tetrapacks?

## About the Script:

I did this experiment at home with my 10 year old niece.

We dug two groups of eight holes each, so that we could water one group and leave one group unwatered. In each group we buried the things mentioned in the Student Guide.

We wanted to wait one week, but she got very impatient and wanted to dig up the things on the third day!

After one week we found that in the watered group the banana peel, onion skin, and bread had decomposed. The brown paper had partially decomposed. The green leaves were mouldy. The aluminium foil and the plastic cup had not changed at all. In the dry group the results were different: The banana peel was black, shrunken, and completely dry, but it still had its shape. The onion skin was partially decomposed. The slice of bread had fungus on it. Some of the green leaves had turned yellow. There was no change in the brown paper, aluminium foil or plastic cup.

We reached the conclusion that under wet conditions things decompose more readily than under dry conditions, but aluminium and plastic do not decompose in either case. Also, the food stuffs get decomposed more readily than the non-eatables.

Afterwards, we thought that we could also try rubber and other kinds of plastic.